APRIL 1, 1937 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

FLIGHT

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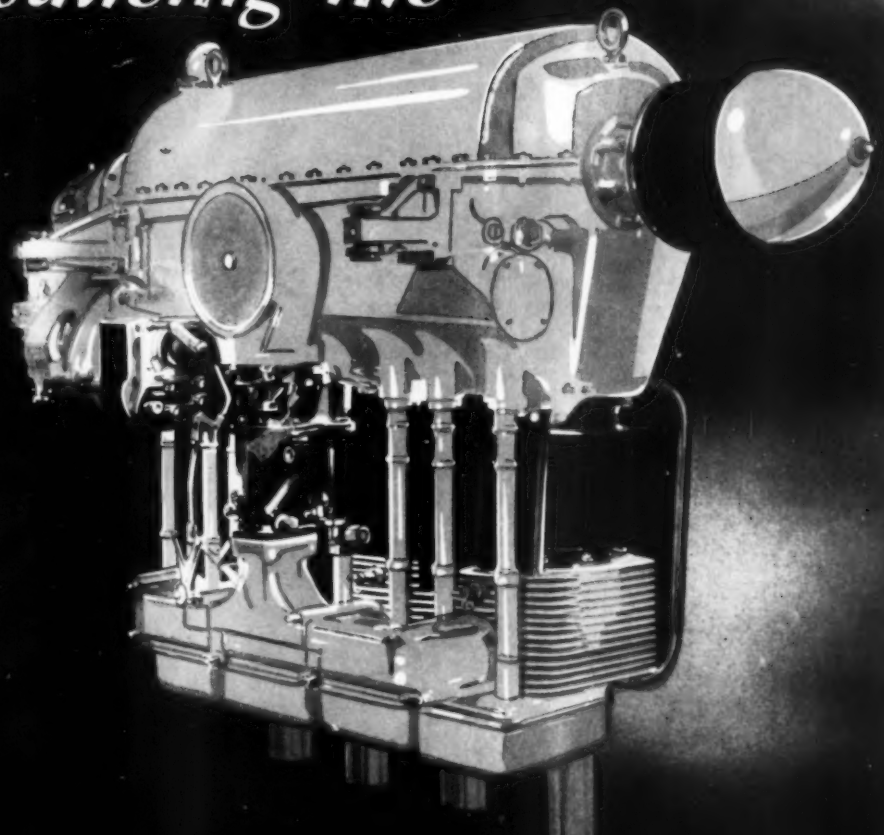

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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A Notable Success

FOR a long time past *Flight* has protested against the anomaly of the position of British Airways, Ltd., and the booking agencies. Under the influence of the Railway Clearing House, we understand, the agencies have been debarred from selling seats in the machines of any British air transport company except Imperial Airways and Railway Air Services. Consequently, if a British subject wished to fly to Scandinavia and went to a booking agency to get a seat he was offered seats in a selection of foreign lines but could not book by British Airways. At first the excuse was made that the booking agencies could only deal with companies which were members of the I.A.T.A., but even when British Airways became members of that association they were still left out in the cold by the agencies. The position was not only unjust, it was illogical, for British Airways are in receipt of a Government subsidy in respect of their Scandinavian services.

Flight's campaign against this injustice has at last been rewarded with success. The matter was ventilated in the House of Commons, and in our last issue we commented on Sir Philip Sassoon's expressed sympathy with the complaint and his unconvincing repudiation of power to intervene. Fortunately, the matter was not allowed to rest there. It was taken up again last week from the front bench of His Majesty's Opposition, and Mr. Lees-Smith pointed out, as *Flight* also did last week, that the Government certainly *could* put pressure on the railway companies through the two Government directors on the board of Imperial Airways, as that company holds one-fifth of the shares in Railway Air Services.

An eye-witness has reported that the indignation of the House was obviously aroused, and the Government were quick to sense that indignation. Sir Thomas Inskip claimed that after the last debate negotiations were taken up with the railway companies on that very question, and, though he said he was perhaps speaking without the book, he took it upon himself to say that the House would not be content with the existing state of things. He believed that it would be in accordance with the wishes of members in all parts of the House that arrangements should be made which would not operate to the prejudice of our British air lines.

So that grievance will certainly be removed, and everybody will rejoice at this triumph of justice and common sense.

Air, Land and Sea

IT is the duty of a Minister for the Co-ordination of Defence to co-ordinate defence so far as in him lies. If Sir Thomas Inskip has hitherto seemed to regard himself rather as a Minister of Supply, he is at last justifying his actual appointment by holding an enquiry into the control of the Fleet Air Arm. The subject was debated with some acrimony in the House of Commons last week, and that acrimony is to be deplored. Despite the dark blue and light blue colours of the two uniforms, this discussion between the heads of the Navy and the Air Force ought not to, and does not, arouse in the public mind the same partisanship which is aroused by the University boat race. It is nothing to the man-in-the-street whether the dark-blue crew or the light-blue crew gets the nose of its boat in front. In that respect *Flight* is but a man-in-the-street. We naturally have constant and cordial relations with the Air Ministry, but what we want to see, and what the public wants to see, is such an organisation of the defence forces as shall give us all the greatest degree of protection if war should come.

The least promising way to achieve that maximum of safety is to have divided control and divided responsi-

bility in any one operation. That there should be fighting men on board His Majesty's ships who are not in the complete care of the Admiralty for recruiting, equipping, promotion, rewards, and possible punishment, is one way of asking for trouble in time of war. The Royal Marines are soldiers, and if they were lent by the War Office to the Admiralty there would be a precedent for the lending of airmen by the Air Ministry. But the Marines are raised by the Admiralty, and that precedent ought to be followed in the case of the Fleet Air Arm.

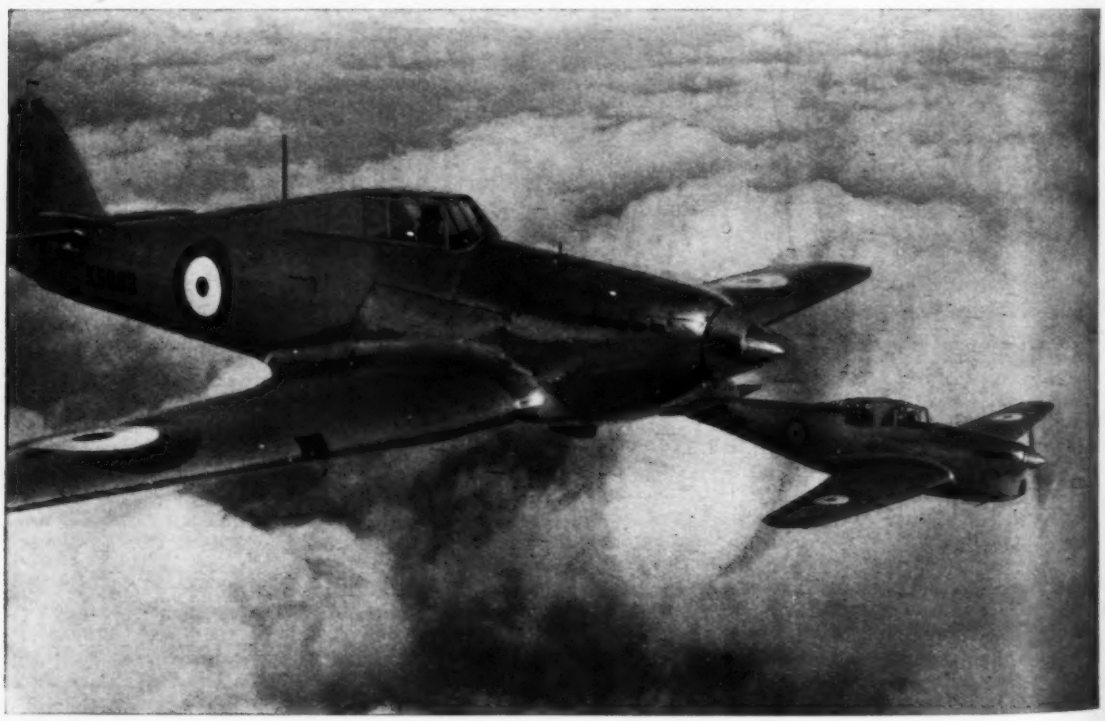
Mr. Churchill has suggested a plan for improving the present unsatisfactory position which is very much the plan advocated by *Flight*. He called his plan "operational integrity, for want of a better term," and certainly the well-known ingenuity of the right honourable gentleman ought to have coined a better one. It will never become such a classic as his "terminologically inexact." In short, he would give the Navy what it really requires for naval operations, and he would give it completely, bag and baggage, while reserving to the Air Force the whole control of air war in its larger sense.

That is the plain, sensible way out of the difficulty. No one ought to ask for more than that, and we must add that nothing but unworthy departmentalism could object to giving that much. We would, however, add the proviso that, so far as flying training is concerned, all *ab initio* instruction should be in the care of the Air Ministry, and only specialised flying for naval purposes (deck landings and the like) should be handed over to the Admiralty. The Air Ministry should also remain responsible for the supply of aircraft, as well as continuing in charge of meteorology and research. The country should not have to pay for duplication of such services.

On all fours with the Fleet Air Arm are the ground elements of air defence. Admittedly, it would be inconvenient for all concerned to convert the Territorial sappers and gunners into Auxiliary Airmen at the present moment, and perhaps that was why Sir Thomas Inskip was able to say that "The Air Ministry . . . are at this present moment very much opposed to any such suggestion being adopted." Present convenience may postpone the application of a principle, but sooner or later that principle will have to be put into practice if the safety of the country is not to suffer.

Sir Thomas was far less adamantine in last week's debate than he had been in the first discussion, and he "conceived it possible that at a much later stage in the completion of the Government's programme the subject might be considered again." That admission is a good deal, and at the present stage it would not be reasonable to ask for more. But whether the gentlemen composing the Air Ministry at any given time are anxious or loath to take over the searchlights and the anti-aircraft guns, it is to be hoped that students of defence problems will not forget this matter and will bring it up again at the appropriate later stage in the completion of the expansion programme. The Air Ministry ought to have possession of those batteries and battalions, whether they say they want them or not.

What is more, it is highly probable that the necessary number of recruits would be far more readily forthcoming in answer to a call from the Air Ministry than to one from the War Office. The former has the better reputation for treating its men well, and, which is even more important, for equipping them with the latest weapons and instruments.



NEW GENERATION: This exclusive *Flight* photograph of the production-type Hawker Hurricane single-seater fighter and the "P.4" two-seater bomber in company near Brooklands anticipates the spectacles of formations of such impressive aeroplanes when, in the not-far-distant future, they are in service with the R.A.F. The Hurricane, which, like its flight companion, mounts the Rolls-Royce Merlin, has already been ordered in quantity. Flt. Lt. Bulman's homely headgear in this picture is a tribute to the civilising influence of the modern enclosed cockpit.

The Outlook

A Running Commentary on Air Topics

The "Capricornus" Disaster

THERE was a time when the lay Press invariably ascribed to engine failure every aeroplane accident which took place. There was some excuse for this, as the aero engines of those days were admittedly far from being the extremely reliable power plants which now equip commercial aircraft. History has a curious habit of repeating itself, and at the present time the dailies have "discovered" ice formation. After almost every flying accident one is told that the machine was forced down by ice. A case in point is the regrettable accident to the Short flying boat which crashed into a hillside in France during the afternoon of Wednesday of last week. The machine was, at the time of the accident, flying in a blinding snowstorm, and ice formation may or may not have been a contributory cause. There is, however, no evidence that it was the direct cause.

Capricornus was searching for Macon, on the River Saone, in order to alight there, and with visibility reduced to nothing she was not certain of her exact location, as radio messages to the Lyons Aerodrome indicated. She was looking for a relatively narrow strip of low land, the valley of the Saone, and on each side were mountains, quite close to the west of the river and rather farther away to the east, but in any case the total width of the low country was only some 40 miles, a distance which the machine would traverse in less than 15 minutes.

Back Where We Started?

THE original cause of the accident appears to have been navigational, as the wireless operator asked for his position. A later message, sent out some four minutes later, was too indistinct to be understood. This seems to indicate that the snowstorm in which the machine was by then flying interfered with the wireless, a phenomenon well known to air-transport companies. In America the engineers of United Airlines have evolved a form of screened and static-proof aerial which is now being fitted to all the aeroplanes of that company. It consists of a copper tube loop inside which is coiled an aerial wire 100ft. long. The copper tube screens the aerial against static, and also protects it from icing-up. The loop is mounted in the extreme nose of the fuselage.

While agreeing that every effort should be made to perfect de-icers and to fit them on all commercial aircraft, an even more pressing need seems to us to be the establishment of very thorough ground organisation on all air routes and a vigorous policy of research into those spheres of radio which still lag behind the perfection of modern aircraft and aero engines. It so happens that the weather conditions which are most likely to affect radio are often also those in which the assistance of radio is most needed by aircraft, and until messages can be sent and received intelligibly in all possible conditions the problem of all-weather flying on all routes cannot be considered entirely solved.

In a way, we are back where we started. The modern aero engine is still, paradoxically enough, responsible for many of the accidents due to bad weather. Its very reliability causes flights to be undertaken in weather conditions which would never be undertaken with engines of doubtful reliability, and ground organisations have not yet caught up with the progress made in the development of aircraft and aero engines.

Specificationitis

PRODUCTION is the cry of the moment. Every aircraft company is straining every nerve to catch up with the delays which have now been officially admitted to exist. Explanations for the delays have been given in the House and have mainly tended to lay the blame on the aircraft constructors, or, as the Air Ministry is pleased to call them, "the contractors," for having been over-optimistic when estimating in advance the probable rate of production.

An article in *Flight* last week threw light on several possible reasons for waste of time in the shops. There is, however, yet another factor which does not exactly help production, and to which we have been calling attention on and off for a year or more: the multiplicity of materials specifications approved by the Air Ministry. It may be, of course, that the technical departments of the Air Ministry, in the goodness of their hearts, desire the designer to have the very best possible material for every conceivable purpose; in that case the designer is obviously faced with a great temptation in that he may see a possibility of saving a few ounces, or even pounds, by using some high-falutin' material for which he may have to wait weeks.

Most people not intimately acquainted with aircraft construction would probably guess that some twenty or thirty materials specifications should cover most reasonable needs. The actual number, at the moment of writing, is one hundred and thirty-three! (133). This fact has recently been published by the Bristol Aeroplane Co., Ltd., in their Review. And the statement is added that this impressive list includes aircraft materials only. "Engine designers have an additional group for their special work."

Are They Necessary?

ONE cannot help asking whether all these specifications —doubtless very admirable in their way—are really necessary. American constructors appear able to get along quite well with a much smaller number, and American aircraft are not markedly inferior to ours in the matter of their ratio of gross weight to tare weight, the figure on which the effect of "a different material for each job" is likely to be most noticeable.

Analysing the materials specifications approved by the Air Ministry discloses the fact that in standard steels, for example, there are 47 different specifications, of which 12 are sheet and strip, 10 are tubes and 25 in the form of bars and forgings. In the rustless class of steel there are 23 specifications, 11 in sheet and strip form, five tubes and seven bars and forgings.

No less surprising is the position in aluminium alloys, the specifications for which reach the surprising figure of 53. In this material the greatest number of specifications, 22, refer to castings, closely followed by 17 specifications in sheet and strip, the rest being made up by ten bars and forgings specifications and four for tubes.

Even magnesium is beginning to assume importance, judging by the fact that it takes ten Air Ministry specifications to cover it, six of which refer to castings, and two to sheet and strip.

After perusing these figures one is left with a feeling of admiration for our metallurgists and metal manufacturers, but it is difficult to suppress an uneasy sort of suspicion that this multiplicity of specifications does not go hand in hand with rapid production.

DIARY OF FORTHCOMING EVENTS—PAGE 320

SALUTE to the ENSIGN

An Imperial Airways model of the Ensign.

A Complete Survey of the New Armstrong Whitworth Monoplane, of which Twelve have been Ordered by Imperial Airways

A 42-seater of 123ft. Wing Span: Four 800 h.p. Fourteen-cylinder Armstrong Siddeley Tiger IX Engines: Over 20 tons Laden Weight

CHARACTERISTICALLY effusive, recent publicity releases from America announcing orders for fleets of large new transport aircraft herald what they are pleased to call the "four-engine era."

The authors, in their overwhelming enthusiasm for the highly promising designs concerned, seem conveniently to have forgotten the superb record of service compiled by the *Hannibal, Atalanta, Scipio, Scylla* and *Diana* classes of Imperial Airways on the European and Empire routes since 1930, so we hereby offer for their consideration the fact that by the time American air lines have four-engined landplanes in everyday service Imperial Airways will be quietly celebrating at least eight years of experience with aircraft of this calibre.

Familiar with the largest practical transport machines in the world, Imperials did not hesitate, as their pioneer four-engined types passed into the twilight of their days, to order from Sir W. G. Armstrong Whitworth Aircraft, Ltd., of Coventry (whose Argosies and Atalantas with their Siddeley Jaguar and Serval engines had given such exemplary service), a dozen monoplanes powered with four Tigers apiece.

Allotted the Armstrong Whitworth works designation "A.W.27" and bearing the contractor's class name *Ensign*, the new machines exhibit great originality, as might well have been expected in view of the surprises sprung upon the aeronautical world by Mr. Lloyd and his colleagues in the Atalanta.

The entire batch of Ensigns is to be assembled at Hamble (leaving the Coventry works free for the production of Whitley bombers, which, incidentally, bear a number of structural similarities to the "27"), where four fuselages are now on the stocks, the first awaiting its wings. No effort is being spared by Mr. A. E. Ar... and his staff, and in a few weeks the world will be shown the first completed machine of the series.

THE ENSIGN CLASS

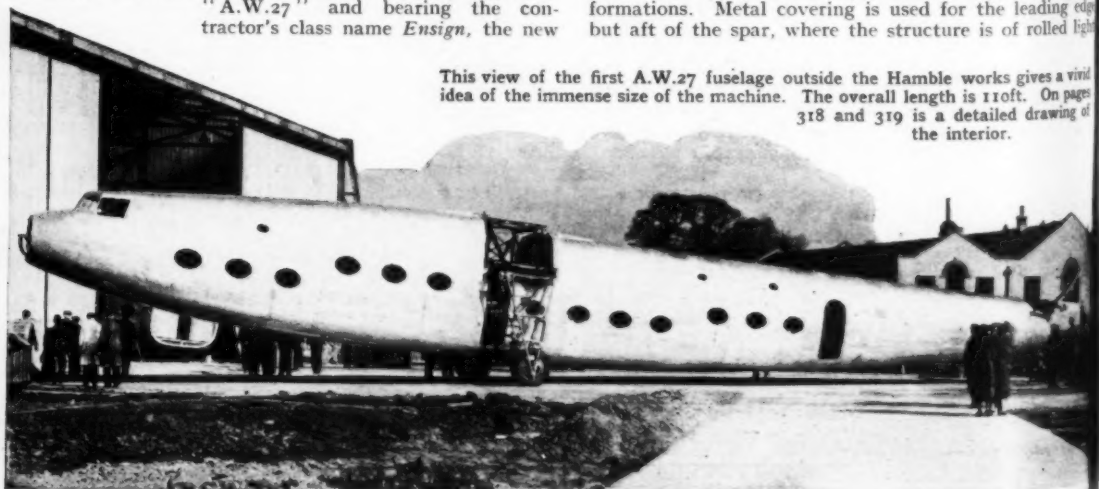
Ensign	Euterpe
Eddystone	Endymion
Elsinore	Euryalus
Ettrick	Elysian
Explorer	Empyrean
Egeria	Echo

Structural Features

An outline of the structural features of the A.W.27 may prove acceptable before setting out to describe the equipment, power plant, accommodation, etc.

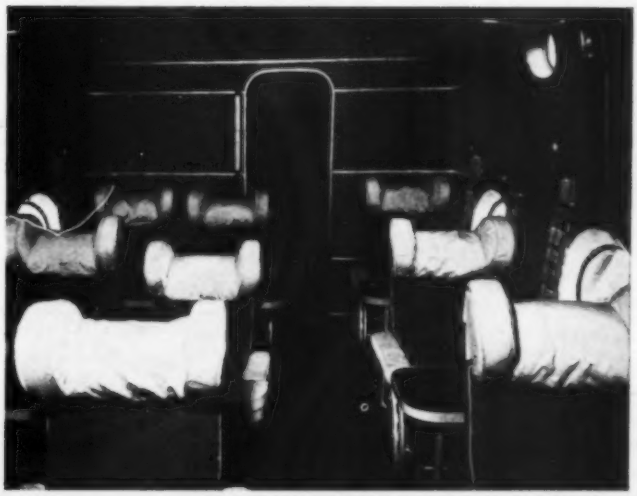
Essentially the machine is an all-metal high-wing monoplane with an undercarriage the halves of which retract into the inner pair of the four wing-mounted engine nacelles.

The wing structure was dealt with in some detail in *Flight* of January 7 this year. Tapering in plan form and thickness, the wing has comparatively square-cut tips. It is built round a single patented rectangular box-spar with top and bottom sides of corrugated light-alloy sheet, the box being stabilised by tubes arranged in diamond formations. Metal covering is used for the leading edge but aft of the spar, where the structure is of rolled light



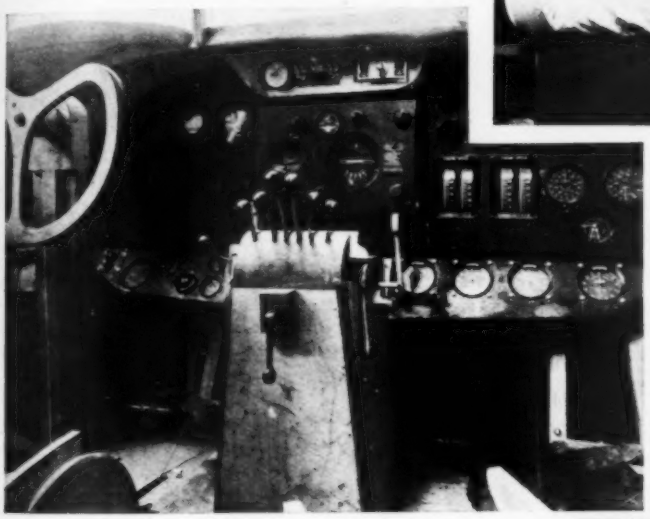
This view of the first A.W.27 fuselage outside the Hamble works gives a vivid idea of the immense size of the machine. The overall length is 110ft. On pages 318 and 319 is a detailed drawing of the interior.

(Right) The passenger seats in each cabin are of Imperial Airways' own design, and are instantly adjustable to any angle required by the user. This view is in the "mock-up" for the Empire-type Ensign.



alloy sections, fabric is employed. Automatic servo flaps are inset into the trailing edge of each of the mass-balanced Frise ailerons, that on the port side being under the control of the pilot for lateral trimming purposes. Split trailing-edge flaps, actuated by four Lockheed hydraulic jacks, extend between the ailerons and fuselage.

The high-wing arrangement offers not only aerodynamic advantages, but is a godsend to passengers, who might otherwise have to endeavour to crane



Some idea of the instrument and control layout can be gathered from this photograph of the "mock-up." On the throttle column can be seen the brake, flap, undercarriage, automatic pilot and v.p. airscrew controls, the positions of which are described in the accompanying article. In the centre is the Sperry panel, while on the left can be seen the essential navigational instruments.

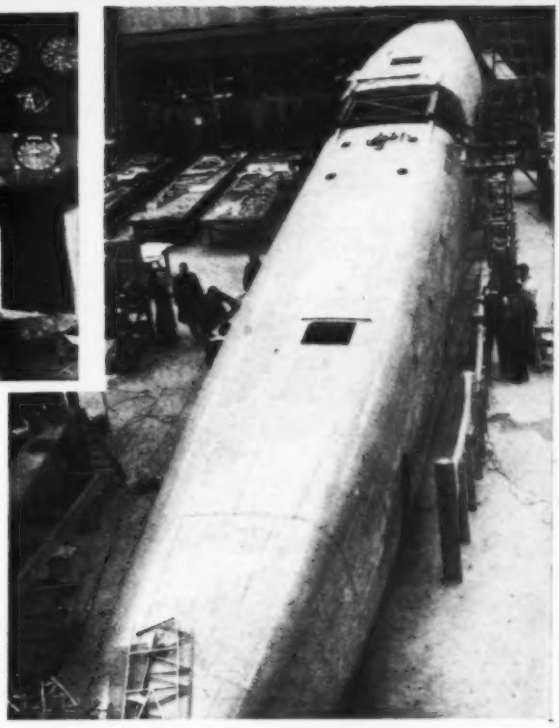
their necks to view scenery past the trailing or leading edge of a low wing. Typically practical, Imperial Airways claim that the high wing also has the advantage of sheltering passengers entering or leaving the machine from sun or rain.

Fuselage Features

An oval monocoque structure a hundred and ten feet long, the fuselage is more or less conventional in conception, incorporating transverse frames, longitudinal stringers and sheet-metal covering. A section is suitably recessed to receive the wing and in this region embodies a massive structure to take the flying stresses. A substantial system of tubular girders is built into the lower portion of the fuselage beneath the floor.

The student of modern design will doubtless be struck by the fact that, as on the Empire flying boats, a single fin-and-rudder assembly is employed, whereas the general tendency abroad is to duplicate this structure. The length of the fuselage and ample fin and rudder area should result in good directional qualities.

Structurally the tail unit is of the monoplane type, the tailplane being built up in a similar manner to the wing. Fore-and-aft trim is maintained by tabs in the elevator, which, incidentally, is not aerodynamically balanced, but has a spring-loaded balancing device incorporated in the internal controls. A servo flap, which is also arranged



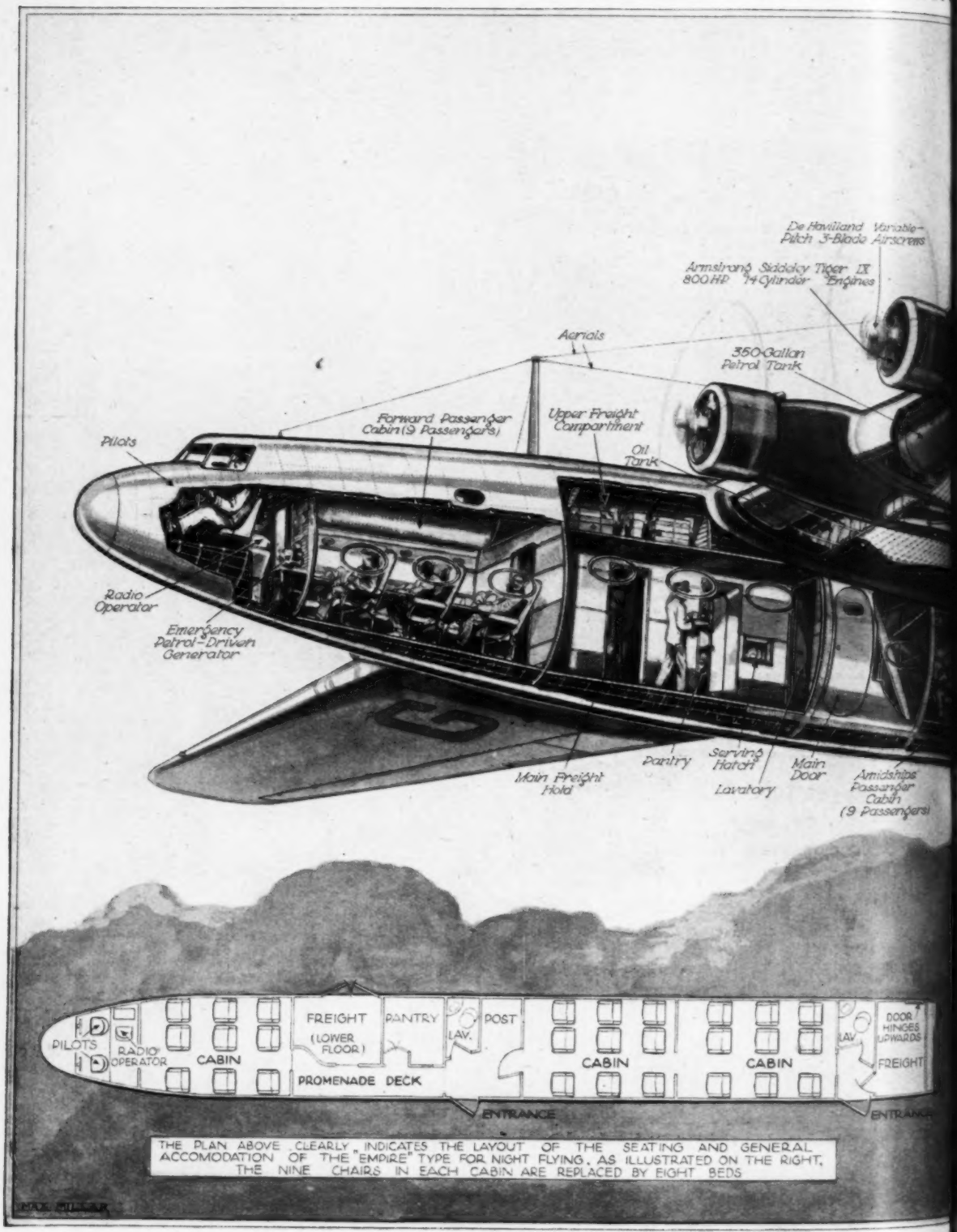
The Ensilage: Another view, taken in the shops, which gives an excellent idea of the massive proportions of the stressed skin body. (*Flight* photograph.)

to function as a trimmer, extends over the entire trailing edge of the rudder. Like the fin, this member is fabric-covered.

Since each of the two *Ensign* types has been designed to the order of a single operating company, it might be expected that the accommodation and interior equipment would bear some resemblance to those of the Short Empire flying boat. This resemblance is, however, superficial, for the machines have been developed for somewhat different purposes.

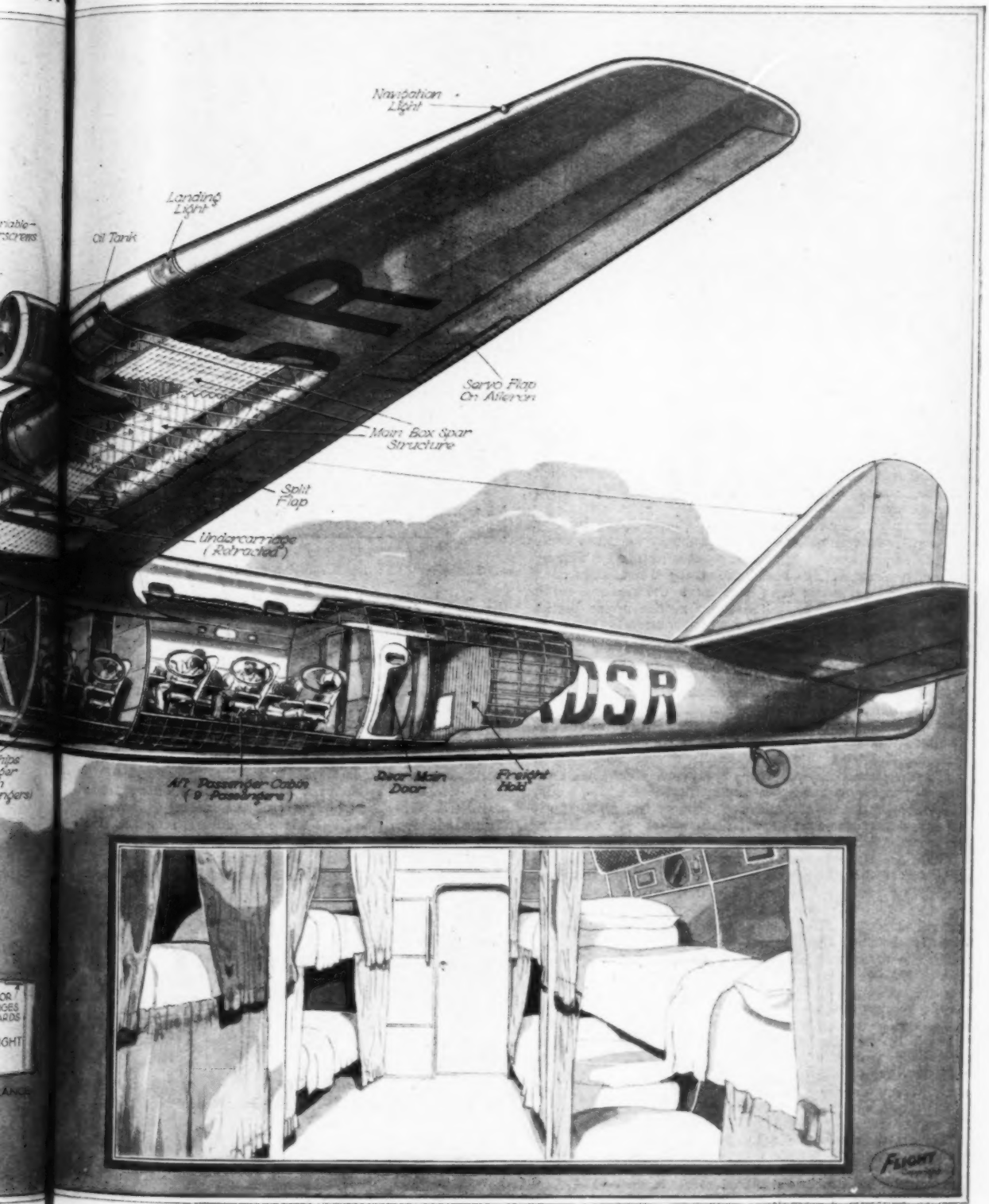
As in the case of the boat, the big Armstrong Whitworth has its passenger quarters arranged so that either chairs or bunks may be fitted, and it is interesting to learn that the change-over in the long-distance or Empire class can

THE ENSIGN UNFURLED: How th

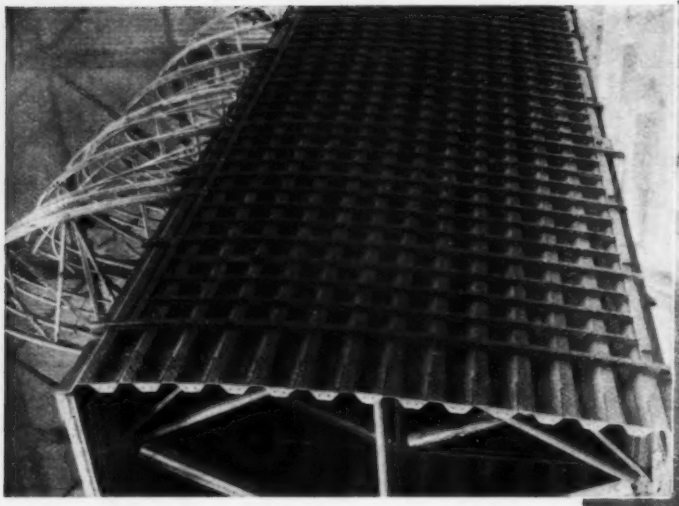


It is no exaggeration to say that the A.W.27 is the most advanced heavy transport landplane (in the stage and nature of its constru
fourteen-cylinder moderately supercharged and geared radial engines, its estimated maximum

th CCOMMODATION is ARRANGED



the degree of comfort and safety it affords its passengers) yet ordered by an airline. Powered with four Armstrong Siddeley Tiger IX
200 m.p.h., the normal cruising speed being about 160 m.p.h. The total loaded weight is over 20 tons.



One of the wings of the *Ensign*, in which corrugated metal sheeting forms the upper and lower sides of the single box spar. The covering is partly of metal and partly of fabric. Only the leading-edge formers are in place in this view. (*Flight* photograph.)

The after end: the fin skeleton. (*Flight* photograph.)

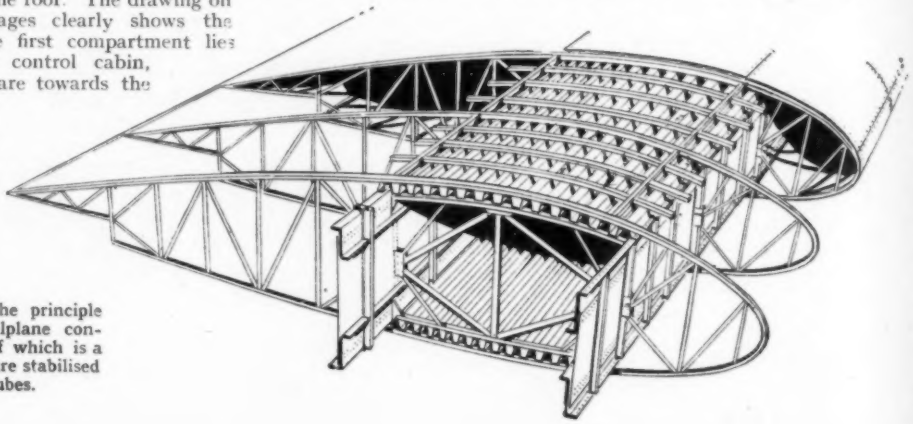
be made in a matter of a quarter of an hour. Twenty-seven seats are removed and are replaced by twenty bunks, with partitions, curtains, and all the necessary equipment for sleeper comfort.

On through services, when a machine is flying by day and night, the change-over would probably be made while the passengers were eating their dinner at the aerodrome hotel or rest-house. The bunks are arranged in tiers of two; those using the lower ones will have the normal cabin windows at their level, while those in the upper berths have small auxiliary windows which normally serve to increase the amount of light in the upper parts of the exceptionally deep cabins.

An interesting aspect of the method of making the day-to-night change-over is the fact that the seats and backs of the daytime chairs are transferred to the bunks and form part of the mattresses; this somewhat peculiar transfer is necessary because these parts of the chair are designed to act as the life-savers which are a legal necessity for any sea-crossing service. The chairs are entirely similar to those developed for the Empire boats, which are the result of some two years of test and experiment and are made at Imperial Airways' own furniture factory at Wandsworth.

There are three passenger compartments in the *Ensign*, and each of these has its own emergency exit in the form of a sliding panel in the roof. The drawing on the two previous pages clearly shows the general layout. The first compartment lies directly behind the control cabin, while the other two are towards the rear of the fuselage. All of them, of course, are well away from the plane of the air-screws and from the vicinity of the main spar, which carries the power units. Furthermore, the corrugations in the bulkheads and so forth should prevent any sign of drumming. The cabins should, consequently, be very quiet even without the addition of the soundproofing equipment which one might expect to see.

Behind the forward passenger compartment is a large freight hold (which can be loaded from the outside through two wide doors), a pantry, a mail department and a lavatory. Beside these compartments, on the port side, is a feature which appears to be very popular with passengers on the Empire boats—the promenade deck. Both here and in the front compartment smoking will be permitted. In the upper part of the fuselage, above the promenade deck area, is a space for normal luggage. The main entrance for the passengers is on the promenade deck and there is another at the rear of the cabin—where, also, there is a lavatory and a second freight compartment



This sketch shows the principle of the wing and tailplane construction, the heart of which is a rectangular box structure stabilised internally by tubes.

with a sliding door. The interior of the tail may be reached, for purposes of inspection, through the rearmost bulkhead.

Apart from the normal fresh-air ventilators, which can be adjusted by each passenger, an exhaust-heated ventilation system is under the control of the steward. This system is described elsewhere.

In the European class of A.W.27 forty-two passengers are carried. Obviously it would not be possible to accommodate them all in the three main compartments, and in the case of this type the forward freight compartment becomes a "cardroom," where four passengers are comfortably ensconced. In addition, there are twelve seats in the forward cabin and twelve and fourteen, respectively, in the two rear compartments.

The cabin windows are of Perspex made up by the Triplex Company, the pilots' windows are of Splintex safety glass, and various inspection panels are covered with Rhodoid.

Generally speaking, the instrument layout is similar to that in the Short boats—not unnaturally, since this layout was the subject of a very great deal of thought and because the boat pilots may occasionally be expected to take over these landplanes at short notice. In the centre of the dashboard is the Sperry automatic pilot panel, while above this are the engine switches and a master switch controlling the undercarriage and flap indicators; until this master switch is moved to the "on" position the engine switches themselves are inoperative and the captain, therefore, cannot possibly take off without first checking the positions of the flaps and undercarriage. Above the screen, in the centre, are the four engine starter and two windscreen wiper switches.

On the left of the Sperry panel are all the essential navigational instruments, including the usual Sperry horizon and gyro, a sensitive altimeter, a rate-of-climb indicator, and so forth. Beside the captain, on his left, are levers controlling the oil relief valve permitting a heavy circulation of oil during the warming-up process) and the slow-running cut-outs for the four Tiger engines. Farther aft on the same side are the fuel tap controls.

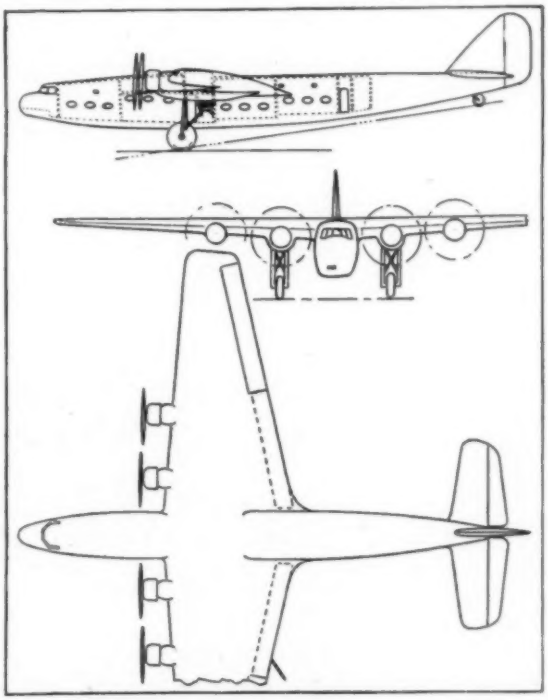
The central throttle bank column carries, in addition to and alongside the four throttle levers, the v.p. airscrew control on the left, and the mixture control on the right. Ahead of the latter, on either side of the column, there are two other levers; that on the left controls the valves for the undercarriage retraction pumps, and that on the right controls the flap-operation valves. The pilot has merely to move one or other of the levers into its new position and the engine-driven pumps do the rest.

Literally "man's size," the Lockheed hydraulic undercarriage jacks, of which there are four, measure 54in. in their closed position and 84in. extended.

On the face of this central column is a small lever which can be moved up, down, or sideways. This little affair controls the entire Dunlop pneumatic braking system. Movement in the fore-and-aft plane applies or releases the brakes, while sideways movement brings the differential operation into play for manœuvring on the ground. On the left of the column and at the level of the brake control lever is the usual Sperry pilot cut-out lever.

A useful feature which is not often to be seen on British transport machines is a direct-reading drift-sight, which is arranged on the floor of the cabin between the two pilots. Each pilot, of course, has his own compass.

The Ensign type can not only be trimmed in the fore and aft and directional planes, but has tabs on each of the ailerons, so that any slight lateral trim differences may be corrected while in flight. This aileron trimming wheel is mounted on the roof above the chief pilot's seat, while the elevator and rudder trimming wheels lie, one behind the other, on the right-hand side of his seat, so that they may be reached by either pilot. An interesting comfort detail concerns the first officer's chair, which not only slides backwards and forwards, but also swivels in order to simplify movements in and about the cabin. Entrance is normally effected through a trap-door in the floor behind the "bridge," though there is, of course, a door leading to the front compartment. An emergency exit is provided.



The striking proportions of the A.W.27 are revealed in these scale drawings.

Behind the pilot's "platform" is the radio operator, who sits facing starboard, on which side are his Marconi transmitters and receivers. In the case of the European type these will have the normal medium-wave tuning range, while the Empire class will, in addition, have short-wave equipment.

Additionally, D/F. equipment is installed; this may be used either for obtaining direct bearings or, with the loop in a fixed position, for "homing." An indicator lies in front of the captain, immediately below his more important navigational instruments. The loop is not of the retractable type.

On the port side of the operator's compartment is a small petrol motor, similar to that used in the Empire boat equipment, which is permanently coupled to a generator. Thus, in case of a long wait on the ground with, perhaps, the radio and lighting in action, the main battery system may be replenished

without the necessity of running one or other of the engines, which, through their generators, normally keep the battery up to scratch. A Rotax switchboard, covering the domestic electrical equipment of the machine, is in charge of the steward. The following Rotax equipment is specified: Two 24-volt, 1,000-watt engine-driven generators with two voltage control boxes; cabin lamps; roof lamps; navigation lights; switches and fuse boxes.

Power is supplied by four Siddeley Tiger IX geared and moderately supercharged radials, which are carried on welded tubular structures forward of the leading edge, these being provided with Armstrong Siddeley patented flexible rubber mountings.

The Siddeley Tiger IX is a recently introduced engine developed from the Tiger VI, as used in large quantities by the Royal Air Force. The engines for the Ensigns will be standard units except for certain drives introduced specially for service with Imperial Airways.

Rated at 790 h.p. at 2,375 r.p.m. at 6,500 feet, the Tiger will deliver 810 h.p. maximum at 2,450 r.p.m. at 6,400 feet. With the three-bladed De Havilland two-position variable pitch airscrews set at fine pitch, 880 h.p. is available for take-off at 2,375 r.p.m., the automatic boost control then being "over-ridden."

"Two-Row" Engines

The engine has fourteen cylinders, arranged in two staggered rows, the capacity being 1,996 cubic inches, and measures 50.8 inches in diameter.

The engines are enclosed in standard Siddeley long-chord cowling rings, which have inner and outer sections for the purposes, respectively, of directing the air flow round the cylinders and giving an aerodynamically efficient exterior.

Petrol and oil tanks with respective total capacities of 670 gall. and 40 gall. are mounted in the leading edge.

A boiler on the exhaust pipe of one of the inboard engines supplies steam to a heater box. Cold air is blown through this box, warmed, and delivered to the cabin, the supply being regulated by the steward. A system of branch pipes supplies cold air.

The A.W.27 has the largest retractable undercarriage developed to date, the entire mechanism for raising and lowering being of Lockheed production. Each of the two independent units is located under each of the engine nacelles, which are of considerably larger dimensions than their outboard neighbours. The Dunlop wheels stand over 6ft. 3in. high and are about 27 inches wide. The retracting movement is rearward and upward into the fairings behind the main spar, a portion of each wheel being left protruding below each nacelle when the gear is completely raised. Doors are provided to preserve a smooth contour when the undercarriage is up, these being interconnected with the retracting mechanism. A special valve allows the fluid controlling these doors to be jettisoned in an emergency without the loss of fluid in the other systems.

Lockheeds were faced with some pretty problems in developing gear to operate the flaps, undercarriage and wheel doors. In all, there are sixteen jacks—four for retracting and lowering the undercarriage, four for the flaps, four for the wheel doors and four to lock the undercarriage in the raised position. The fluid system has three engine-driven pumps. The pilot is provided with the new Lockheed selector valves which return the operating levers to neutral when an operation is completed.

The undercarriage jacks are 3½ inches in diameter, and should raise the wheels in 1¼ minutes and lower them in 50 seconds.

Over 200 m.p.h.

Complete estimated performance figures for the A.W.27 are not available, but the top speed should exceed 200 m.p.h., and the economical cruising speed is expected to be about 160 m.p.h., although, undoubtedly, the machines could be continuously operated quite safely at a higher speed. Fully laden they will weigh rather more than 20 tons and should be able to maintain height at 12,500ft. using only three of their four Tigers and at 4,000ft. on two engines.

The normal range will be 500 miles against a 40 m.p.h. head wind, but with extra tankage and reduced payload this can be increased to 1,000 miles under the same conditions.

Among the firms which are stated by the makers to have supplied components and accessories for the Ensigns are the following:—

Accles and Pollock, Ltd., Aircraft Materials, Ltd., Albion Drop Forgings, Ltd., Aluminium Corporation, Ltd., Arens Controls, Ltd., Automotive Products, Ltd.

Benton and Stone, Ltd., J. Beresford, Ltd., T. M. Birkett, Ltd., Birmabright, Ltd., Birmingham Aluminium Castings, Ltd., D. H. Bonnella, Ltd., James Booth and Co., Ltd., Bowden Engineering Co., Ltd., British Aluminium Co., Ltd., British Celanese, Ltd. (Celastoid), British Marine Aircraft, Ltd., Brooke Tool Mfg. Co., Ltd., E. G. Brown and Co., Ltd., Brown Bros. (Aircraft), Ltd.

Cork Mfg. Co., Ltd., De Bergue Patents, Ltd., De Havilland Aircraft Co., Ltd., Dunlop Rubber Co., Ltd., Fairey Aviation Co., Ltd., Firth-Vickers, Ltd., General Aircraft, Ltd., High-Duty Alloys, Ltd., Hoffman Mfg. Co., Ltd., Lightalloys, Ltd., Magnesium Castings and Products, Ltd., Manganese Bronze and Brass Co., Ltd., Masson, Seeley and Co., Ltd., May and Baker, Ltd. (Rhodoid).

Northern Aluminium Co., Ltd., Parnall Aircraft, Ltd., Ransome and Marles, Ltd., Reynolds Tube Co., Ltd., Rotax, Ltd., Rotherhams, Ltd., Rubery Owen and Co., Ltd.

Geo. Salter and Co., Ltd., Short Bros., Ltd., Simmonds Aerocessories, Ltd., Skefko Ball Bearing Co., Ltd., Smith's Aircraft Instruments, Ltd., Sperry Gyroscope Co., Ltd., Splintex Safety Glass Co., Ltd., Stirling Metals, Ltd., Superflexit, Ltd., Tecalemit, Ltd., Geo. Tucker Eyelet Co., Ltd., Vickers Aviation, Ltd., Vokes, Ltd.

MAJOR W. B. SHILSON'S AIR MINISTRY APPOINTMENT

ASSOCIATED with the Armstrong Siddeley organisation since its earliest days, Major W. B. Shilson is shortly leaving to take up an important Air Ministry appointment, that of Assistant Director of Aeronautical Production. In this capacity he will be largely responsible for the administration of the engine side of the expansion programme.

In the earliest days of motoring, Major Shilson was with the B.T.H. company, at Rugby. In 1906 he joined the Wolseley company, and then became associated with Mr. J. D. Siddeley (now Sir John Siddeley) at the time when the old Siddeley-Deasy concern was formed. Major Shilson continued his association with the organisation when it became known as Armstrong Siddeley, and, in quite recent times, when it became a part of the Hawker-Siddeley combine.

Major Shilson was mentioned in despatches and awarded the O.B.E. during the War, when, after a spell in German East Africa, he was in command of transport and workshops at Dar-es-Salaam. On returning to Armstrong Siddeley's after the war he designed the "Dragon" tank and the 14 h.p. Armstrong car, subsequently becoming service manager. For the last ten years he has been identified almost entirely with aero engine work.

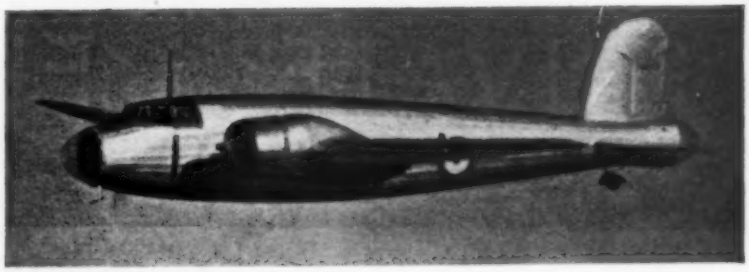
For the last four years Major Shilson has been chairman of the Coventry branch of the Royal Aeronautical Society.

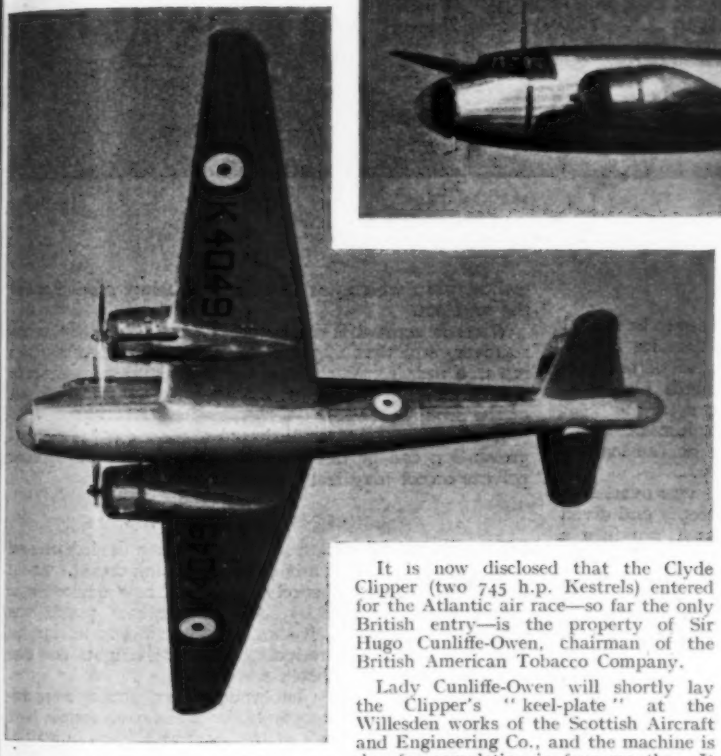
SUPER SHORTS?

THE revelation by Sir Philip Sassoon that a fleet of flying boats, specially designed for Transatlantic service, should be available in the course of 1938, recalls the statement made by Mr. Arthur Gouge that no problems remain for solution in the production of a flying boat weighing about 80,000 lb., or double the weight of the Empire boats. Mr. Gouge emphasised that in many respects the projected machine would be superior, notably in the matter of cruising speed, which would be about 180 m.p.h., its range and the ratio of payload to gross weight.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS





LINES: Two striking "shots" of the Vickers Wellington medium bomber built to Air Ministry specification B.9/32 and ordered in quantity for the equipment of certain R.A.F. squadrons. The engines are of the latest Pegasus type. It will be noted in the right-hand view that crankcase cowlings of a type which was popular in the U.S.A. some years ago have been fitted experimentally.

AN order for a number of Mercury-engined Gloster Gladiators has been placed by the Swedish Air Force.

In spite of the demands of the expansion programme, British exports of aeroplanes, engines and components during 1936 attained a record figure of nearly £3,000,000.

Parachutes were used in recent tests at Susaki airdrome, Tokyo, to reduce the distance covered by a machine when landing. They were attached to the tail and opened just before landing.

It is now disclosed that the Clyde Clipper (two 745 h.p. Kestrels) entered for the Atlantic air race—so far the only British entry—is the property of Sir Hugo Cunliffe-Owen, chairman of the British American Tobacco Company.

Lady Cunliffe-Owen will shortly lay the Clipper's "keel-plate" at the Willesden works of the Scottish Aircraft and Engineering Co., and the machine is due for completion in four months. It is intended to fly it out to New York for the start.

Miss Amelia Earhart, who reached Honolulu last Thursday week on the first stage of a round-the-world flight in a special Lockheed Electra, has been forced to abandon her project pending repairs to damage sustained by her machine when a tyre burst while taking off on the following Saturday.

The Austrian Aero Club is anxious to hear as soon as possible from British owners intending to take part in the Whitsun Austrian tour (May 14-20). Entries may be made through the Royal Aero Club.

The Royal Aero Club has prepared a list of the names and addresses of private owners of aircraft. It can be obtained on application to the Royal Aero Club, 119, Piccadilly, London, W.1, price 10s.

Twenty-five Years Ago

From Flight of April 6, 1912.

"We do not count ourselves among the rabid adherents to the principle of the dirigible balloon, believing, as we do, that the main development of man-flight must be along the lines of the heavier-than-air machine."

THE CRITICS: The Hawker staff at Brooklands have groomed enough thoroughbreds during the past few years to know a good aeroplane when they see one From "George" Bulman downwards the general opinion seems to be that the "P.4" light bomber will deliver the goods in true Hawker abundance. (*Flight* photograph.)

Topics of the Day

This Ice

ALTHOUGH the amateur pilot should never be forced to fly in cloud or in such weather that ice formation is a possibility, the whole subject of the prevention of icing-up is in all our minds just now. Furthermore, there can be occasions when even the most cautious of amateurs may suddenly find himself flying in sleet—and sleet can form very prettily on the leading edges, where dry snow usually blows away.

Only last week, while motoring north, I was overtaken by a Moth which, quite suddenly, turned steeply and dived away on a new course. A moment later I ran into a blizzard which reduced visibility to a quarter of a mile or even less. Where the pilot of the Moth got to I don't know, but the blizzard lasted only ten minutes, and it would probably have been easily circumnavigated.

While flying myself I've probably been mildly iced-up on three or four occasions, and then only when deliberately flying in cloud for practice—with permission and in recognised cloud-flying areas. In each case the accretion only occurred in a layer perhaps three hundred feet deep.

In comparison with those business people and others who often need to travel abroad, I rarely fly on scheduled air services, but on at least four occasions I have watched the ice building up on leading edges and on sundry projections. Only once might the formation have had serious consequences. This was in the days before D.L.H. had fitted their particular form of heater to any units of their fleet, and we were cruising around over Berlin, well throttled back and with the flaps down, waiting for permission to go into Tempelhof. The ice formed clear and deep. At about the same time a Deruluft machine, refused permission to enter Tempelhof, and weighed down with ice, had flown into a hillside near Stettin.

The Last Fence

PEOPLE continually ask why this ice trouble has only appeared during the past year or two. The answer is simple. Never before have transport machines flown in such bad weather, because, in days gone by, the pilots did not possess really reliable aids to blind navigation.

Transport crews still have trouble with radio on occasion, but if a machine is otherwise fully equipped it is generally possible to manage somehow without it, now that there are three airports over here (and dozens on the Continent) with ultra-short-wave approach beacons. In any case, the tendency on really large craft is to have duplicated radio. The blind-flying instruments are already duplicated, and engine-driven vacuum pumps nullify the possibility of failure here.

Ice, therefore, is the last fence—and it appears to be a singularly high one, judging from the amount of experimental work which has been, and is being, carried out on the problem.

What is wanted is an ice-preventer rather than an ice-remover, and that appears to be the opinion of our own research people. Mechanical removal devices appear to be satisfactory up to a point, but they do not go to the root of the problem.

If an inexpensive and simple "chemical" method of prevention can be developed, then even the unimportant private owner may feel a little happier.

Emergency Measures

ABSOLUTE perfection in ice-prevention devices does not appear to me, however, to be so important. At the best, a de-icer should surely be treated as a device for use in emergency. Little by little, as the Met. people learn more about their job, it should be possible to forecast the possibility of ice accretion at different heights and over different areas with absolute accuracy.

De-icers would only be brought into action when formation occurred unexpectedly, or when a dangerous layer must be passed through at the start and finish of a flight. When conditions are really bad, the services would automatically be cancelled—as they are to-day.

Even if those de-icers at present available are not quite perfect, they at least give the crew of a transport aeroplane that extra chance which might make all the difference between safety and disaster.

Certain it is that the ice accretion danger is very real. The fact that the newspapers have now discovered this danger and apply it as a certain cause of almost every crash which occurs does not affect its importance. The early morning newspaper pilots meet it regularly, and a pilot of Jersey Airways told me that he once crept into Southampton Airport so heavily loaded with ice that the machine could scarcely be kept in the air. If he had been flying a thick-wing monoplane he would probably have failed to get through, since the effects on the airflow would, in comparison, have been so much more marked and important. It was this same pilot who, after a very violent lightning effect, lost the use of his compass and radio, and, I believe, found his machine full of holes at a time when knowledgeable people were poo-pooing the dangers of lighting.

Yet Jersey Airways probably have a safer record than any airline company in the world.

Since air transport is the real corner-stone of the entire flying business, it must, at all costs, be made safe. The public has learnt to differentiate between that and military flying, which must necessarily be carried out with an eye to striking efficiency rather than to safety. Each civil accident not only dismays the casual traveller, but upsets the prospective amateur.

INDICATOR.

FROM the CLUBS and SCHOOLS

NOTTINGHAM

LAST week the flying time at Tollerton amounted to 19 hr. 20 min. Mr. W. Leeming-Jones started training for his "A." Miss J. Hayward, Lt. T. Bett, and Mr. F. Kenning have joined the Club as associate members.

MIDLAND

The Midland Aero Club flew 17 hr. 5 min. dual and 12 hr. 45 min. solo during the week ended March 25. Cross-country flights were made to Hatfield, Reading, Southampton, Tollerton and Pershore. A Hornet Moth (G-AEVU) has now been added to the fleet of privately owned machines.

LEEMING

Time for the week ended March 27 totalled 49 hr. 30 min. Mr. J. C. Pick, one of the Club's pilots, has returned from his flight to Cairo. Mr. King has gone solo, while Mr. J. Rowntree has completed his tests for the "A" licence. Mr. Headlam has ordered a Miles Whitney Straight.

HYDERABAD

Members of the Hyderabad State Aero Club flew 156 hr. 25 min. during the months of January and February. Nawab Asadullah Khan, Messrs. E. K. Jassavalla, C. J. Reddy and Nawab S. K. Hussain have passed their "A" licence tests, while Nawab K. Amathullah Khan and Mr. Mirza Bahadur Ali Baing have gone solo. All four sons of Maharaja Sir Kishen Pershad Bahadur are very enthusiastically taking up flying.

NORFOLK AND NORWICH

During the past week forty hours were recorded at Norwich. The majority of this flying took place during the Easter holidays, which were also responsible for a number of visitors by air. Among them were Mr. John Grierson and Flt. Lt. R. C. Preston in a B.A. Swallow from Woburn. Flt. Lt. Preston's last visit was on a happier occasion when he and the Duchess of Bedford landed at Mousehold some two years ago in her Moth.

PORTSMOUTH

The flying time for the Portsmouth Aero Club for the week ended March 26 was 31 hr. 35 min. New members are Lt. Cdr. H. C. Maclean, R.N., and Messrs. J. G. Younghusband, E. C. W. Beale, W. P. Mc. Eldowny, J. E. Collins and R. D. Williams. Miss A. Fawsitt has qualified for her "A" licence along with Mr. J. D. G. Bishop, who is now going forward towards his "B" licence. Night-flying instruction was given on March 15 and 22, and it has been arranged to give such instruction on Monday evening each week when weather permits.

BENGAL

During February members of the Bengal Flying Club put in 8 hr. 50 min. flying. Return cross-country flights were made to Tatanager, Maheshganj and Berhampur.

YAPTON

Flying times for March to the 27th were 84 hr. 35 min., the weather on the whole being fair. New members are Mr. David Archer and Mr. W. T. Reid; both are taking the £15 "A" course. Mr. Lalitmohan Manilal has passed his "A" licence tests.

ROYAL AIR FORCE

Members of the R.A.F. Flying Club will be sorry to learn that Capt. E. C. Winkley, who has devoted his whole time to the honorary secretaryship of the Club for nearly three years, has been reluctantly compelled to resign. His successor will be F/O. R. G. Weighill.

HERTS AND ESSEX

Weather conditions permitted flying on eleven days only during the fortnight ended March 18, the total time for the period being 60 hr. 50 min. New members are Messrs. B. D. Bolas, J. H. Charsley, E. H. Church and H. C. Ferguson. ABMF and ABIM (privately owned aircraft), and ABTZ, the Club's Stinson, are again in service after their C. of A's.

CAMBRIDGE

Flying time at Marshall's Flying School for the fortnight ended March 28 totalled 87 hr. 25 min. Messrs. Wallis, Loch, Smithers and Eldrett have joined the School, and Mr. Gardiner has gone solo. There has been a good deal of joy-riding over the flooded Fens and cross-country flights were made to Heston and Abridge. Snow storms and squally weather held up flying on three days of last week.

BROOKLANDS

Flying time for the nine days ending March 29 was 112 hr., during which time Messrs. Ezekiel and Whittet passed their height tests and Mr. Metford made his first solo. During the week Messrs. Bailey and List flew to Edinburgh and back in a Puss Moth, calling also at Renfrew and Liverpool. On another day they and Mr. Orton made a return trip to Le Bourget. Mr. Lovell flew to Le Touquet and back. Flt. Lt. Grey has left for Palestine in a Tiger Moth; on arrival he is starting a flying school. New members are Messrs. Botting, Barnett and Santos Casani. Mr. Casani served in the R.F.C. and R.A.F. during the war.

CINQUE PORTS

New members who joined the Club last week were Messrs. R. C. Cockburn, G. T. Booth, A. Monteith, and C. F. Hughesdon, while Messrs. Walter Stern and Tony Jephson were welcomed back after an absence of several months. The Easter rush of private owners abroad once more saw the Club very busy administering to the needs of the inner man (and woman); sixteen machines clearing outwards from Lympne on Friday alone. Flying hours for the week showed a definite improvement, sixty-eight being recorded. Last Tuesday week the Monospar returned from Austria flown by Flt. Lt. Hogan. He had a pleasant trip, except for the weather, which held him up for one day at the German Air Force aerodrome at Hall, near Stuttgart. The officers of the Squadron were very helpful to him, showing him over the town and later lending him maps.

ANOTHER FLYING LABORATORY: The first of the new Heston Phoenix monoplanes with Series II Gipsy Six engine and v.p. airscrew has been ordered by Standard Radio and will be used for experimental and demonstration work. (*Flight* photograph.)

Private Flying

C. A. S. C.

During last week-end members flew 8 hr. 25 min. at Cambridge, of which two hours were flown in the School's Puss Moth. Next Sunday will be an open day at Fen Ditton aerodrome and members of all squadrons are invited to enter for the various flying competitions.

BRISTOL AND WESSEX

Club flying time at Whitchurch for the fortnight ended March 27 amounted to 38 hr. 50 min. New members are Miss C. E. Warren, Messrs. J. B. Nanda and R. Elton, while Mr. E. G. Goscombe has completed his "A" licence tests. There are two new "B" licence pupils—Messrs. E. G. Davis and J. H. Hickman.

YORKSHIRE

Club aircraft flew 32 hr. 45 min. at Yeadon during last week. The weather improved generally, and a number of long trips were made. New flying members are Mr. E. V. Green and Mr. R. J. Howard, while Mr. W. E. Collins has rejoined as a flying member. Mr. B. Ramsden has joined as a temporary flying member, and Mr. J. Morton has joined the Aviation Group.

Civil Service Flying

ON March 18 some two hundred civil servants attended the inaugural meeting of the projected Civil Service Flying Association. A committee was formed, with Mr. Holliday, of the Air Ministry, as chairman. Mr. J. Collins, to whom a great deal of the credit for the organisation is due, has been appointed secretary.

Originality at Ards

THE official opening of the North of Ireland Aero Club's new club house took place on Sunday, March 21. This building was presented by Lord Londonderry, and he arrived, very appropriately, in his own Monospar S.T.25 to perform the ceremony.

The chief instructor, Flt. Lt. R. W. E. Bryant, then took over, giving a talk on flying training in general. By means of very careful timing and the use of a signalling lamp, it was found possible to synchronise the movements of a real machine in order to illustrate this. A recently qualified pilot added a brief account of his own experiences. This part of the programme was certainly original and caused a good deal of interest.

Thereafter the afternoon was spent in giving trial lessons to visitors in two Cadets, while those less immediately interested were given free flights in cabin machines owned by two members, Messrs. Carr and Mitchell.

Cubbing in Denmark

THE Danish Minister of Public Works, Mr. Fisker, recently explained that a new arrangement had been made concerning manufacture of the Cub in Denmark. The Government has discarded the idea of co-operation between Mr. Hedegaard and the shipyard Nakskov Skibsværft.

Instead, the buildings formerly owned by the German Rohrbach concern will be taken over by the Danish Cub Company. These premises, which are located in the immediate vicinity of Kastrup Airport, have not been used since Rohrbach, many years ago, abandoned their activities in Denmark.

Production will mainly be confined to the Silver and Standard Cub types, and the latter will be sold at a price of £310, including free training. The factory's output during the first year will be at least 300, as the plant will work mainly for export. As previously mentioned in *Flight*, the Danish subsidiary will have, as a market, the whole extra-American world. The engines will be "semi-Danish."

For Caterpillar Club Aspirants

Parachute and Personal Safety Equipment Manual. (Air Publication 1182.) 10s., H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2

THE third edition of A.P. 1182, just published, deals with the Irvin type parachute and other equipment designed for the safety of flying personnel. Such a life-saving apparatus loses its value if it does not inspire absolute confidence, and this it cannot do unless it is in perfect order. Every detail of design, type, maintenance, packing and use is thoroughly dealt with. The care of parachutes is a great responsibility, and all who by nature of their occupation are brought into contact in any way with their care should have at hand a copy of A.P. 1182.

Steel Analysis

"Standard Methods of Analysis." Published by The United Steel Companies, Ltd., 17, Westbourne Road, Sheffield, 10, price 4s. 10d., post free.

THIS is a revised edition of United Steels' publication "Standard Methods of Analysis of Iron, Steel and Ferro-Alloys."

The original volume contains selected standard methods agreed by a committee of chemists and metallurgists as being the most suitable for general use in the laboratories of the group of companies comprising United Steels. No "short" or approximate methods are included as it was decided that these, however useful, could not be regarded as "standard."

In the preparation of the second edition there has been no departure from the original procedure. The text has been revised and in several instances modifications have been introduced. In addition to the methods previously published, the new edition contains fourteen additional methods, including the determination of manganese, phosphorus, vanadium, titanium, aluminium and zirconium in alloy steels, together with the determination of tungsten, molybdenum, vanadium, chromium and titanium in their respective ferro-alloys.

Brown Bros. Aircraft Progress

AT the fortieth annual general meeting of Brown Brothers, Ltd., held in London last week, Mr. J. Albert Thomson, the chairman and managing director, paid particular attention in his speech to the progress of the firm's aircraft side, for which a special company was formed last June under the title of Brown Brothers (Aircraft), Ltd.

Their aircraft business, which was started before the war, had grown up with the industry, and to-day they could claim to be the largest producers in the country of small parts for aircraft.

The factory of Brown Brothers (Aircraft), Ltd., in North London had been extended and was now in full production, while during the year they had completed the erection and equipment of an additional factory on the Lea Bridge estate; this also was in full swing.

The aircraft metals department had been considerably enlarged, and the service given was of great advantage to customers in these days of steel shortage and delays.

Further Westland Development

IMMEDIATELY before the Easter recess a further development took place in the Westland and British Marine merger project, reported on page 326c of this issue.

In a circular posted to shareholders on Thursday, the directors of Westland Aircraft, Ltd., intimated that it had been decided not to proceed with the purchase of British Marine Aircraft. A statement by the board of the latter company is expected as we go to press.

Ahead with Alloys

AT the annual general meeting of James Booth and Co. (1915), Ltd., held recently in Birmingham, Mr. C. Herbert Smith (chairman) spoke of the company's strong progress. This was particularly marked in the light alloy department. The needs of the aircraft industry had naturally compelled them to extend their capacity for manufacturing rolled light alloys, particularly Duralumin, and Aldural (the coated variety of Duralumin). They were making further considerable extensions to their rolling mills and installing the complementary extra plant in the casting and heat treatment departments of the works.

One of the most conspicuous successes of the year had been an improvement developed by them in the method of production of airscrew blades. This Duralumin blade, pressed completely in one operation, had proved to be the best yet produced and, said Mr. Herbert Smith, been very favourably received.

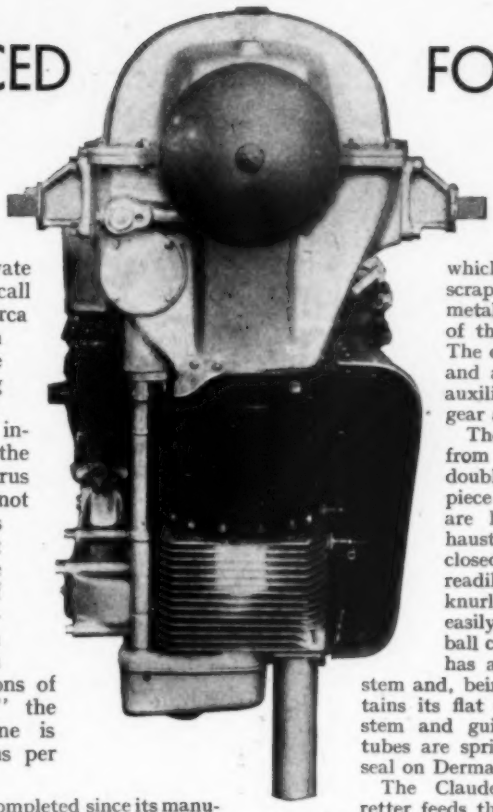
They were erecting and equipping a complete new plant which would be the most up-to-date large press department for non-ferrous work in the country. It was not designed solely for airscrew work, but would be equally useful for the production of various types of large pressings which it was believed will be a feature of future aircraft design.

In Elektron, an interesting achievement had been the successful production of fuel tanks of large capacity.

An ADVANCED FOUR-IN-LINE

Increased Power and Structural Revision of the Cirrus Major 150

Modern Refinements Throughout



EARLY birds in the private flying movement may recall that the Cirrus I (circa 1925) gave a maximum of 60 h.p. and that without valve gear enclosure, side cooling chute, cylinder baffles, flametrap, exhaust stubs or spinner, but including dual ignition, it turned the scales at 288lb. The latest Cirrus offering (which should attract not only the private owner who wants a completely modern power plant giving those welcome "few more horses," but also the operator of light commercial machines) produces 150 h.p. for near enough the same weight; and whereas the Cirrus I consumed 5.6 gallons of petrol an hour at "full bore" the Major 150, as the new engine is known, requires only 6½ gallons per hour in obtaining 138 h.p.

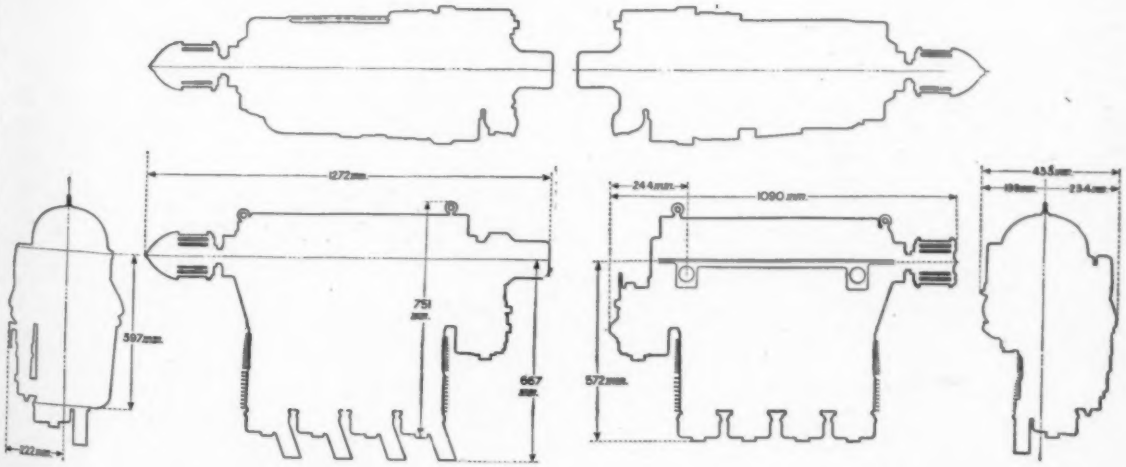
The Major 150 (which has been completed since its manufacturers became the Cirrus Engine Section of Blackburn Aircraft, Ltd., of Brough, E. Yorks) exhibits a number of features, external and internal, which differ from those of the Mark I Major. It will quickly be discovered on inspection that there are no long cylinder holding-down bolts and that the heads are similar to those on the Cirrus Minor, which are "Y" alloy castings spigoted and secured to the barrels by twelve studs, a laminated copper washer assuring gas-tightness. The top half of the valve gear casing is cast integrally with the heads. The wholly machined barrels are retained by four short studs on the crankcase.

Fully floating gudgeon pins carry the "Y" alloy pistons, which have two compression and two scraper rings apiece, and plain white-metal bearings are used at both ends of the Hiduminium connecting rods. The crankshaft has five plain bearings and a front ball thrust bearing; the auxiliary drives are taken from a gear at the rear end.

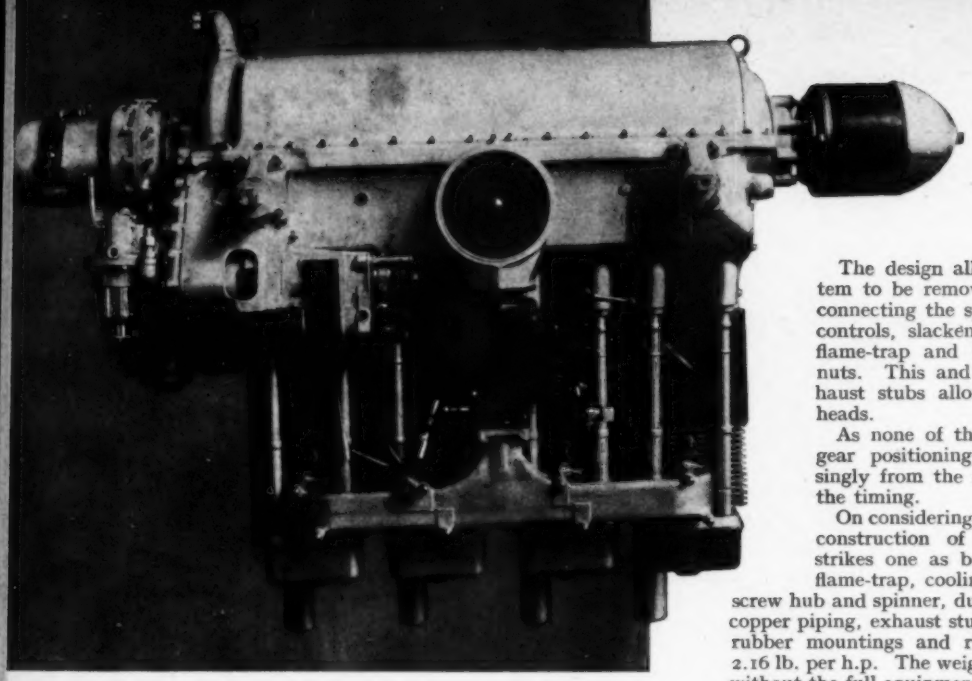
The K.E. 965 valves are operated from a five-bearing camshaft by double-ball-ended push-rods and one-piece rockers. The tulip inlet valves are larger than the mushroom exhausts. All valve gear is totally enclosed, but the rocker boxes are readily removed by unscrewing a knurled knob, and clearances are then easily checked and adjusted at each ball cup on the rockers. The ball itself has a flat which bears on the valve stem and, being free to turn in the cup, it retains its flat contact, thus helping to reduce stem and guide wear. The push-rod cover tubes are spring-loaded and have an oil-tight seal on Dermatine rings.

The Claudel-Hobson downdraught carburetter feeds through a cast Alpax alloy manifold and has an independent altitude control. The fitting of a flame-trap allows a warm air intake inside the cowling so that an air-induction scoop need not be fitted.

Special attention has been paid to accessibility and neatness of installation, and, in this connection, noticeable and commendable is the absence of external oil-pipes, these being shrunk into the alloy crankcase casting and the leads to the bearing webs drilled through from the outside and plugged. A single main oil-pipe feeds the triple oscillating piston-type pump, which has the advantage, it is claimed, of operating with greater lift than the gear type for low-placed oil tanks. The oil-pump gear, which can be seen



Installation diagrams of the Cirrus Major 150, giving main dimensions in millimetres.



A prominent feature on the starboard side of the Major 150 is the flame-trap.

The design allows the whole induction system to be removed in a few minutes by disconnecting the spring-loaded ball joints of the controls, slackening a steady bracket on the flame-trap and undoing eight locating dome nuts. This and the simple fitting of the exhaust stubs allow quick removal of cylinder heads.

As none of the accessories has a particular gear positioning any one may be removed singly from the rear cover without disturbing the timing.

On considering the full equipment and sturdy construction of the Major 150 the weight strikes one as being creditably low, for with flame-trap, cooling chute, cylinder baffles, airscrew hub and spinner, dual Amal pump and its flexible copper piping, exhaust stubs and new Cirrus Minor type rubber mountings and rigid metal feet the ratio is 2.16 lb. per h.p. The weight of the complete engine, but without the full equipment, is 300½ lb.

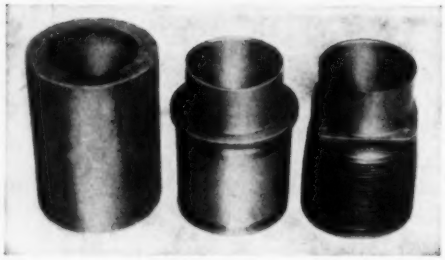
A 12-volt, 60-watt generator, with drive and housing, an inertia starter and all other equipment, increases the total weight to 351½ lb. + or − 5 lb. It is intended to supply a combined manifold-silencer for the exhaust stubs.

To add to the general clean and smart appearance of the engine all external polished parts are plated or stove enamelled. A kit of tools for running adjustments is supplied and the engine is designed to run on any first-grade motor car fuel of 70 octane value.

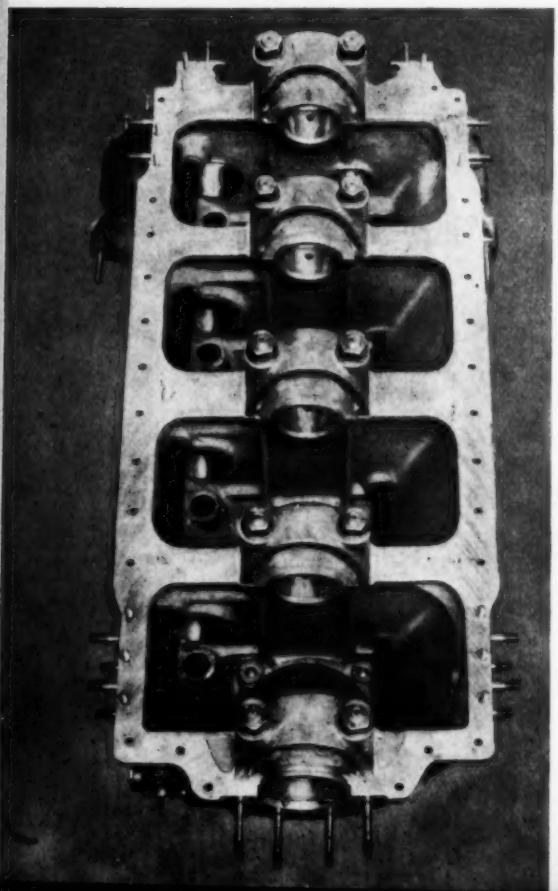
The suppliers of the various

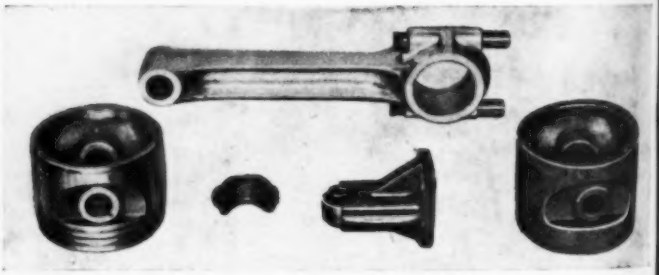
clearly from the induction side, is located in a well formed at the rear of the main crankcase. A return main oil-pipe, a pressure pipe from a nipple on the main casting, a flexible petrol pipe and the carburettor and ignition controls and intercontrols remain for connection to complete this part of the installation.

Petrol and oil filters are seen to be very conveniently placed for inspection and cleaning, and air scoop windows, not shown in the photographs, will give ready access to the K.L.G. sparking plugs on production engines.



A cylinder billet, the rough turned cylinder and a cylinder finned and flanged but awaiting final grinding operations.



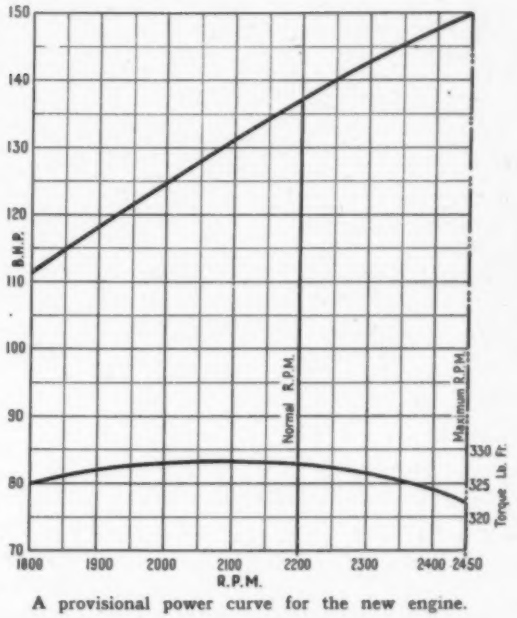


On the left is the crankcase with main bearing caps in position (note "shrunk-in" pressure feed pipe and scavenge pipe); above are a connecting rod, partly machined, showing the jig pins, and a rough and a finished piston together with a Lord resilient mounting in a bearer foot; and below is the crankshaft with its front ball race.

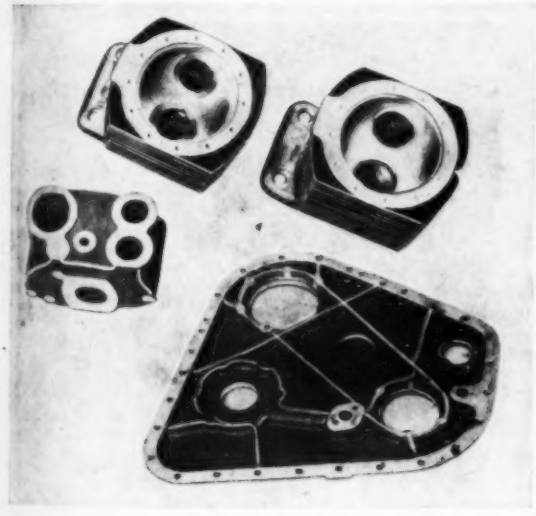
materials and items of equipment are as follows:—

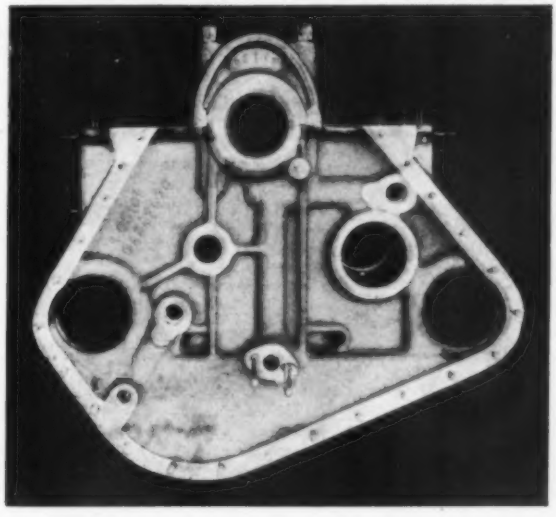
Carburettor: H. M. Hobson (Aircraft and Motor Components), Ltd.
Magnetos, Starters and Generators: British Thomson-Houston, Ltd.
Sparking Plugs: K.L.G. Sparking Plugs, Ltd.
Petrol Pumps and Flame-trap Element: Amal, Ltd.
Crankcase Castings, Heads, Pistons, Timing Gear Cover, and Bearing Caps: Birmingham Aluminium Casting Co., Ltd.
Cylinders and Airscrew Hub Stampings: Turton Platts, Ltd.
Connecting rods: High Duty Alloys, Ltd.
Camshaft and Tappets: Weyburn Engineering Co., Ltd.
Bearer Feet, Crankcase Cover, Induction Manifold, Flame-trap Castings, Rocker Box Covers, and Oil Pump Body Castings: Sterling Metals, Ltd.
Crankshaft: Laystall Engineering Co., Ltd.
Bearings (Main and Connecting rod): Glacier Metal Co., Ltd.
Rocker Arms and Brackets: Hughes Johnson Stampings, Ltd.
Valve Springs and Circlips: Geo. Salter and Co., Ltd.
Piston Rings: Wellworthy, Ltd.
Magneto Couplings: Simms Motor Units, Ltd.
Rubber Jointings: Dermatine Co., Ltd.
Ball Races: Hoffmann Manufacturing Co., Ltd.

THE CIRRUS MAJOR 150	LEADING DATA
Bore and stroke	120 × 140 mm.
Capacity	6,330 c.c.
Compression ratio	5.8 to 1.
Normal output at 2,200 r.p.m.	138 h.p.
Maximum output at 2,450 r.p.m.	150 h.p.
Fuel consumption :—	
At cruising revs	6½–7 gall./hr.
At maximum revs	11 gall./hr.
Oil consumption	1–2 pt./hr.
Bare weight of engine	300.5 lb.
Weight with standard equipment	324.6 lb.
Weight with full equipment including starter and generator	351.5 lb. + or — 5 lb.



A provisional power curve for the new engine.





On the left are the timing gear cover, cylinder heads in two stages of manufacture and the oil pump body casting, while on the right is the rear end of the crankcase.

WESTLAND, BRITISH MARINE AND BRITISH AIRCRAFT

AT an extraordinary general meeting of Westland Aircraft, Ltd., held last week in London, the chairman (Sir Ernest Petter) invited the shareholders to approve a proposal for the acquisition (at a price of £250,000) of British Marine Aircraft, Ltd., and to sanction the necessary increase in capital. Sir Ernest explained in detail how the acquisition of the Hamble works would allow expansion (impracticable at Yeovil) in order to cope with large orders at present sub-contracted. The matter of manufacturing the Sikorsky flying boat would be considered later, when the pressure of the defence programme was relieved.

Captain P. D. Acland (managing director) said that at the last moment a point had arisen on the contract which British Marine Aircraft had entered into with the British Aircraft Manufacturing Company under which the latter received a management fee of £5,000 per annum for a period still to run of about four years. The majority of the directors did not feel that they could advise shareholders to accept any part of that liability. Certain negotiations were still taking place. He therefore proposed as an amendment that the meeting be adjourned until Tuesday, March 30.

The amendment was seconded by Mr. W. E. W. Petter (technical director).

The chairman said that the British Aircraft Manufacturing Company had consented to the agreement being cancelled for a payment of £5,000, and he did not consider that it was in the interests of the shareholders for the whole matter to be held up because of the payment of such an amount. He was, therefore, against adjourning the meeting.

After some discussion the amendment was put to the meeting and lost by nine votes to 19.

The original resolution for the acquisition of British Marine Aircraft was carried *nem. con.*

A further resolution increasing the capital to £750,000 by the creation of a further 1,000,000 new shares of 5s. each was also carried *nem. con.*

The TREND of INVENTION

Recent Aeronautical Patents Reviewed

Floodlight and Beacon

FOR the permanent lighting of landing grounds lamps are used which direct a fan-shaped beam of light which has a large divergence in a horizontal plane but a small one in a vertical plane. It is sometimes required to use this lighting as a beacon, in which case the fan-shaped beam is tilted about a horizontal axis and then caused to rotate about a vertical one. By this means a series of one or more flashes will be observed for each revolution. Depending on the axis about which the beam is tilted the beacon may present different characteristics to different observers depending on their respective heights.

It has been found, however, that if the axis about which the beam is tilted is suitably chosen not only are the number of flashes seen per revolution the same when observed from all heights, but the light of the beam is used to the greatest advantage. Thus, if the fan-shaped beam is tilted about an axis coincident with or only at a small angle to one of its edges, the desired result is obtained. Means for carrying this out are described in which an elongated reflector is tilted by gearing about the desired axis.—*Patent No.* 452933: *General Electric Company, Ltd., and E. L. B. Damant and W. A. Villiers.*

Oil Cooling

A METHOD of cooling oil, particularly applicable to aircraft, consists of the use of two concentric tubes of nearly the same diameter so that the annular space between them is very narrow. Oil is passed through this annular space and is cooled by the stream of air which passes through the inner tube and over the outer one. In order to improve the cooling effect, corrugated metal fins are inserted in the annular space, and these contact with both tubes. This increases the conducting surface and also causes a turbulent action to be set up in the oil.—*Patent No.* 450261: *Serck Radiators, Ltd., and H. E. Upton.*

Cowling and Cooling

IN order to prevent the air which is used to cool the engine cylinders from acquiring heat from the exhaust ring, thereby impairing its cooling efficiency, the Bristol Company proposes in this patent to divide the air into two separate streams, an outer one for the purpose of cooling the exhaust ring, and an inner one for the engine cylinders.

In the construction described, the exhaust ring, which is of streamline form, is fitted just inside of the engine cowl, the outer wall of the ring being in contact with the inner surface of the cowl. In the front opening of the cowl is fitted a circular baffle which splits the incoming air into two streams. The major central portion of the air flows past the engine cylinders. The air entering between the edge of the baffle and the outside edge of the cowl, flows past the exhaust ring and escapes through the annular space round the exhaust ring and through ducts along some of which the exhaust tail pipes also pass. By these means both the engine cylinders and the exhaust system are maintained at low temperatures with a consequent increase in general efficiency.—*Patent No.* 451296: *Bristol Aeroplane Company, Ltd., and A. H. R. Fedden.*

Automatic Pilots

IN automatic steering gear for aeroplanes provision is made for maintaining the aeroplane on a given straight course, or, alternatively, for following a given curve. In general the steering is effected by an electric motor actuating the rudder, the motor being controlled by a relay. The relay may be connected to either the course-steering apparatus or the curve-steering apparatus as required.

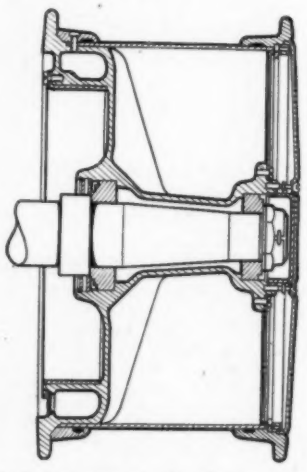
If the change-over to the curve steering is made when this is set for an extreme position, the craft would turn abruptly to an altered course. This is prevented by a means described in a patent whereby the proper connections of the relay to the resistances which control the steering can be made only when the curve-steering apparatus is in the neutral or central position. If the curve-steering is switched in with the control set for some curve previously steered, blocking means prevent the control working and thus a sudden change in the course of the aircraft is avoided.—*Patent No.* 452728: *Siemens Apparate und Maschinen G.m.b.H.*

Wheels

A SIMPLE construction of a wheel which is easy to manufacture and which, it is claimed, satisfies all the requirements of an aircraft wheel is described in two Bendix patents.

As will be seen from the illustration, the wheel consists of a hub member, mounted on bearings on a spindle, on one side of which is a load-carrying disc which also incorporates the brake drum. On the other side is a second load-carrying disc and between these two discs the tyre rim is carried. The hub, disc, brake drum and one tyre flange are all formed in a single casting. The rim is formed from sheet metal, as is also the second disc, and these are connected together by a retaining ring which forms the second tyre flange.

In the second patent the entire wheel is formed from sheet-metal parts, the rim, tyre retaining flange and one load-carrying disc being in one piece whilst the other disc and brake drum are built up from several parts, the whole being welded together.—*Patents Nos.* 455625 *and* 455687: *Bendix Aviation Corporation.*



A section through the Bendix wheel and brake.

Differential Braking

IN *Flight* of September 10, 1936, another patent of the Bendix Aviation Corporation was reviewed; it related to hydraulic braking in which equal braking was applied to each wheel when the brakes were applied by a hand lever, but in which the braking on the two wheels could be varied when applied from the rudder bar control. Similar results are obtained in the scheme covered by the patent No. 453796, which relates to cable-operated brakes.

The hand control operates a lever which moves about a fixed pivot and on the lever are mounted two pulleys round which pass the cables to the brakes of the two wheels. The ends of these cables are anchored to the two sides of a rocking bar which is pivoted at its centre and which is capable of being turned about this pivot by the rudder bar, which thus tensions one cable and releases the other so as to give differential braking.

The cables are arranged so that they are initially slack, with the result that movements of the rudder bar do not normally affect the brakes and the cables do not interfere with rudder operations. A slight tensioning of the cables by the hand control brings the differential unit into operation.—*Patent No.* 453797: *Bendix, Limited, and P. E. Hall.*

Boost Control

WHEN a supercharger can be driven, at will, at more than one speed with respect to the engine speed, then the boost control pressure required will depend upon the relative speed of blower to engine, if the most favourable results are to be obtained.

An arrangement is shown whereby a variable-datum boost control is set by a mechanical linkage which is connected to the variable speed gearing of the blower. By this means the datum of the boost control is automatically set when the gear is selected for driving the blower.

There is a second patent with the same object in view. In this case the fuel supply to the carburettor is varied according to the altitude of the machine by a capsule acted upon by the atmospheric pressure. An interconnection is now suggested between this mixture-strength control and the change-speed control for the blower, so that the mixture strength is automatically varied with the speed of the blower.—*Patent Nos.* 453915 *and* 454154: *Bristol Aeroplane Co., Ltd., A. H. R. Fedden and G. O. Anderson.*

Rotor Drive

IN rotating-wing aircraft, the rotor blades may be temporarily connected to the engine through suitable reduction gearing. When taking off it is necessary to drive the rotor blades at a certain predetermined speed for a limited period without at the same time making the airscrew rotate at such a speed as to cause the aircraft to take off, and without producing unnecessary stresses in the transmission system. A transmission gear by which these results can be satisfactorily obtained is described in patent No. 452922.

The engine drives a shaft which is coupled by a hydraulically operated clutch to the driving member of a hydraulic coupling. The driven member of this hydraulic coupling is connected to the input shaft of a change-speed gear box, the output shaft of which is connected to the rotor blades. To drive these the hydraulic clutch is engaged and a suitable gear selected. The hydraulic coupling drives when the engine speed reaches a suitable value and brings the rotor up to the required speed, after which it can be disconnected from the engine by the operation of the hydraulic clutch. The engine is then speeded up to drive the airscrew.—*Patent No.* 452922: *J. Yoxall and Propello Inventions, Limited.*

A DAZZLER: A production-type Bristol Blenheim medium bomber (two Mercury VIIIs) "dazzle-painted" for entry into the Service. If the "paint-job" is as dazzling as the performance the machine should be practically invisible.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

A RACE OF SUPERCHAPS?

THE article in your issue of March 18 on "Sailplane *v.* Aeroplane," by "Bellerophon," contains much that should be taken with a grain of salt by any who would join the band of engineless fliers, whom one might be led to believe were a race of superchaps.

The suggestion that there is anything difficult about flying sailplanes is just rubbish, pure and simple, and the answer to the question on page 268b as to how many power pilots could fly a high-efficiency machine at exactly* 3 m.p.h. above its stalling speed is "hundreds, given about ten hours' practice, and an A.S.I. up to the job." The real difficulty is to get an A.S.I. which works reasonably at low speeds, the normal pitot instrument being pretty hopeless except, possibly, for the more modern machines, which tend to be some 10 m.p.h. faster than the older types.

To spread abroad the "intrepid birdman" stuff is, of course, very flattering to those who soar, although during the last year or so the legend has been rather debunked, and, one can safely say, is not supported by the younger generation of pilots.

Those who wisely take up the grand pastime of soaring will find that sailplane pilots are not distinguished from their fellows by skill or wizardry, but by an enthusiasm that, until you catch it yourself, passes understanding.

Norton-on-Tees, Durham. LLEWELLYN H. BARKER.

[* I use the word "exactly" in the loose way in which the author does. No one can do anything "exactly," of course.]

COMPARATIVE RELIABILITY

WITH reference to a letter in *Flight* of February 25 regarding the comparative reliability of automobile and aero engines, it may interest you to know that I have just completed some 950 hours' driving during the last twelve months, and that during that time I never had an involuntary stop, I have never cleaned a sparking plug (or renewed one), have never had valves adjusted, have never had the engine adjusted, have never had the engine decarbonised, and have, in fact, given the minimum of attention other than supplying the necessary oil and fuel, together with an occasional round of the grease gun. My car is a mass-produced Morris 10 h.p. with no refinements. A great deal of my running is done on intermediate gears; the engine is treated none too gently but has never failed to start from dead cold.

I am not surprised at this freedom from trouble. I renew my car yearly, not because it is unreliable, but because I have a contract which allows me to do so. Five years ago I had a Talbot of 1927 vintage which had done over 120,000 miles and was still going strong. I travelled right round England in this old car and had one involuntary stop—for a puncture.

During the past fifteen years the only car which gave me any trouble was a sports model with "high-efficiency" engine, and in this all my troubles were concentrated.

Let aero-engine manufacturers give us this assurance that their engines are as reliable as are those in the modern car and I shall have no hesitation in entrusting my life to an engine of this efficiency. Performance should signify freedom from trouble and not "horses per pound weight."

In the light aero engine class my experiences were unfortunate. To begin with I experienced a complete disintegration of camshaft and rocker arms, then failure of the oil pump, followed by breakages of valve springs, all within a period of a few short weeks, the total engine hours amounting to not more than five or six at the most. This is an appalling state of affairs and sufficient to make one condemn flying for the "man in the street." Provided we fly behind (or in front of) an engine of the converted four-cylinder car type, we can be reasonably safe, but a few more unfortunate breakdowns will either make me resign myself to motoring or rely on "vetted" club machines in future. Thousands would take up flying of ultra-light machines if any confidence could be placed in the available power units. CYNICUS.

Anstruther, Fife.

WITS-SHARPENER FROM RHODESIA

SOME time ago you published some "nuts to crack." During several hundred hours of flying in this country (Southern Rhodesia) on pleasure bent, the undermentioned problem has been the most puzzling to come my way. I am in the position of having my machine permanently housed one hundred and forty miles from the nearest ground engineer, and have to figure things out the best way I can.

The machine is a Heinkel He.64D low-wing monoplane with Gipsy III engine fitted with one A.C. fuel pump and one auxiliary hand-operated fuel pump. It has stub exhausts which stand just proud of the cowling.

On my return from Johannesburg a short while ago, concluding a trip of about 1,800 miles, I noticed when about ten miles from home that the petrol pump pressure gauge, instead of reading 0.1 kg. had its needle bang over against the stop at 0.9 kg.; then the pressure became so great that the gauge started to leak and I knew that the carburettor was also flooding, although the engine ran quite normally. The pressure was relieved slightly and spasmodically by stalling the machine on the way in. On landing, the undercarriage was found to be saturated with petrol from the flooding carburettor.

Examination of the engine-driven fuel pump revealed no fault except that the vacuum test showed 2in. of mercury on the suction side and this was brought up to 10in. by renewing the valves and diaphragm in the pump. On replacing the pump the reading was correct on the ground but the machine was not test-flown until the fault could be found.

Later, by examination and starting and stopping the engine, it was found that No. 4 exhaust periodically released compression and, on taking the cylinder off, the exhaust valve seat was found to have come adrift and to be cocking-up and jamming the valve in the open position. This was rectified with a new head; and the petrol trouble disappeared.

As everyone knows, the pressure delivered by the fuel pump

is fixed by the tension of the spring under the diaphragm and this cannot increase (though it can, of course, decrease with any fault in the pump). It should be noted that the petrol pump pressure gauge is led off between the pump and the carburettor. The nut to crack is: "What caused this pump to increase its delivery by about 10 times its normal pressure, with the engine giving its correct revs and running normally?" This nut has been put to several ground engineers and they have had to give it up.

Umtali, Southern Rhodesia. H. PERREM.

[Our correspondent's theory as to the solution will be found at the foot of this page.—ED.]

MAPS OF INDIA

I THINK it may serve some useful purpose, and be of assistance to any of your readers who are anticipating an aerial tour or flight over India, to know the position with regard to Indian maps.

In the first place, the usual scale is sixteen miles to the inch, and although this may seem to present a difficult problem to those accustomed to flying on four inches to the mile, from my own experience the scale offers no difficulty.

Secondly, every precaution should be taken by the pilot to check the aviation information which may be printed or subsequently inserted on the maps he is using. If the map concerned has been printed in 1935 it will be reasonably up to date, but in all probability there will be a number of landing grounds or aerodromes constructed since the publication which do not appear. On the other hand, if the map has been published some years ago, as, for instance, the 1930 publications, it may be immediately assumed that much important aerial information is missing, and that in some cases landing grounds will be shown which in actual fact do not now exist.

From my own experience of flying in India, which is now quite extensive, I would offer the following suggestions to the prospective flyer: any maps required should be obtained from the Aero Stores, of 170, Napier Road, Karachi, who make a special work of maintaining the maps they supply up to date, not only with the fullest aviation information as to landing grounds and aerodromes, but, in addition, they ink in any railways. This last service is of the utmost importance to the pilot as a number of railways have been constructed in recent years and do not appear on the maps at present.

Anybody proposing a flight to India would be well advised to write in advance to this concern, asking them to prepare maps for the route they propose to follow, and have these maps ready at Karachi or to await their arrival at their place of entry into India. R. VAUGHAN-FOWLER.

Bombay.

AERODROME SURFACE CONSOLIDATION

AN article in *Flight* of March 4, on earth stabilisation by means of bituminous emulsions, reminded me of a very interesting series of experiments in the same field, now being carried out in America. The method of stabilising referred to is by means of ordinary Portland cement, and at present they are experimenting with road surfaces, which is an even greater test than would be in the case of a landing field. [In fairness to the firm interested in the bituminous emulsion process it should be pointed out that they claim considerable experience with road surfaces.—ED.] The method employed is very similar to that required when using bituminous emulsions. The turf is first removed and the soil below is broken up with harrows. The cement is then spread on with sand sprinklers, and once again the harrows are used to mix the cement and soil.

The correct quantity of water is then sprayed on, and after a further mix the whole is consolidated with rollers and levelled off. The quantities of cement and water to be used depend entirely on the nature and water content of the soil; but one thing is certain—this method of stabilisation is economical, up to date and has proved highly successful in road building, which suggests that it might prove a first-class method of dealing with aerodromes where the nature of the soil is suitable.

London, S.W.1. R. S. T. LEWIS.

A Curate's Egg

Airman Friday. By William Courtenay. Forewords by Lord Londonderry and Amy Mollison. Hutchinson, 12s. 6d.

AIRMAN FRIDAY reminds us of the little girl with the little curl (who, when she was good was very, very good, etc.). Mr. Courtenay has been Airman Friday to a number of Crusoes, notably Mrs. Mollison, and in this autobiography we learn what is involved in being general factotum to a touring air display or Svengali-cum-Cerberus to an ocean flyer.

Much of *Airman Friday* makes good reading. We liked his war service in Palestine. His chapters on Sir Alan Cobham's pioneer air display convey a vivid idea of the sixteen-hour working day of the advance publicity manager and "fixer-upper" of a big barnstorming outfit. His sidelights on the off-stage life of the record-breakers will interest quite a lot of people (everyone likes to know how much the makers of Ovitabo are good for). And there are stories of "scoops" that compel one to acknowledge the author's resourcefulness as a newspaperman.

But Mr. Friday seems to have had difficulty in sifting his wheat from his chaff. The reader is expected to wade through interminable catalogues of civic dignitaries, minor notabilities and near-nonenities with whom the author has shared platforms and luncheon-tables, and towards the end there are far too many dead-as-mutton facts about events such as the Australia race. Surely nobody, over two years after, cares whether the handicaps were adjusted at Baghdad or Timbuctoo? Nor will the average reader feel that a twelve-and-sixpenny book is the place for quite unblushing expositions of the virtues of two particular makes of aeroplane, however good these aeroplanes may be.

Airman Friday must have been produced in record time (such recent events as the accident to the *Daily Express* Dragonfly are fully dealt with). It is also unusually well illustrated with sixty-nine photographs.

The Solution?

THE solution to our Rhodesia correspondent's engine mystery "*may be*" (he writes) "that at a speed of 100 m.p.h., air pressure built up in the stub exhaust was passing by the faulty exhaust valve, through the cylinder and past the inlet valve when it opened, and so on down the induction manifold through the by-pass to the float chamber. In turn, it built up a back pressure on the fuel line, causing the carburettor to flood and the fuel gauge to register high. If anyone has a better explanation, shoot it along!"

Vickers' Appointments

VICKERS-ARMSTRONGS LIMITED announce the appointment to their Board of Mr. A. Dunbar and Mr. A. B. Winder, both of whom are directors of English Steel Corporation, Ltd.

Air Ministry Lease Daimler Premises

OCCUPYING an area of nearly 500,000 sq. ft., the Daimler offices, stores and service station at Sandy Lane, Coventry, have been rented by the Air Ministry. The works will be used, it is believed, for the storage of transport vehicles and equipment. The Daimler establishment is being moved over to the company's main works at Radford. The Sandy Lane premises are near the new Daimler "shadow" factory.

The Hawker Light Bomber

IT may be recalled that the close-up photograph of the new Hawker light bomber published on page 265 of *Flight* of March 18, showed the retractable undercarriage. This equipment should be correctly described as being of Hawker patented design, though the actuating gear is the work of Aircraft Components, Ltd., who, incidentally, are also responsible for the operating gear of the wing flaps, radiator shutters and Dowty retractable tail wheel.

Through a Glass Brightly

PRODUCED primarily for Coronation sightseers unlucky (or unmuscular) enough to secure close vantage-points, a new Meyrowitz production, the "Tele-Glas," may also interest those who habitually attend aviation meetings and do not like to be cumbered with binoculars. It consists simply of two lenses which the user holds 18in. apart, it gives a magnification of ×45, and the price (including pocket-size Morocco leather case) is 25s. Further details are obtainable from E. B. Meyrowitz, Ltd., 157, Regent Street, London, W.1.

Insurance Appointments

AT a recent meeting of the board of the British Aviation Insurance Co. it was announced that, for reasons of health, Sir Arthur Worley had relinquished the chairmanship of the company, which office he had held since 1931. Sir Arthur still remains a director. Mr. Herbert Lewis—chairman of the Commercial Union Assurance Co.—has been elected as his successor, and Mr. W. W. Otter-Barry has been elected deputy chairman to succeed Mr. Charles Hendry.

THE DUCHESS of BEDFORD

IT is with universal regret that the death of the Duchess of Bedford has to be presumed. On Monday, March 22, she set out in a Moth from her aerodrome at Woburn Abbey on what was intended to be a short flight, and since then, despite intensive search by R.A.F. aeroplanes and others, no trace of her has been found. She was aged 71.

Very unostentatiously, both the Duke and Duchess of Bedford have done a great deal of useful public work. Future ages will probably chiefly remember the work both of them have done for zoology and ornithology. *Flight* is naturally chiefly concerned with the Duchess' career as an airwoman. When she was 61 she set out as a passenger in Capt. C. D. Barnard's Fokker (with Bristol Jupiter) named *Princess Xenia*. This was the machine in which Capt McIntosh and Col. FitzMaurice started off on an attempt to fly the Atlantic, though they soon returned to Baldonnel. Afterwards McIntosh and Bert Hinkler started in the same machine to fly a great circle course to India, but were forced down in Poland by appalling weather. On the Duchess' first flight to India she and Capt. Barnard were forced down at Bushire by engine trouble, and waited at that very warm spot for ten weeks for a new engine. Then the Duchess bought the Fokker and re-named it *The Spider*. Its bad luck immediately left it. The Duchess engaged Capt. Barnard as her private pilot, and in August, 1929, they both flew to India and back in eight days, which was a record and a very fine one. Next year they made another record by flying *The Spider* to South Africa and back in twenty days. The Duchess then qualified for her "A" licence.

Nearly ten years ago she did *Flight* the honour of writing her impressions of her first year's experience as owner of a Moth; she began flying in an open machine and one cannot help feeling that she would have expressed the hope that she might also finish it in that way. Among the first British private owners, Her Grace remained to the end a devotee of the open cockpit aeroplane. Last year the Editor of *Flight* had a most interesting correspondence with her on this subject. To her the small cabin aeroplane was not to be compared with the open type. She loved the great outdoors, and did not mind the amount of draught which found its way around the screen. Her deafness kept the engine noise from becoming distressing, and one suspects that when Her Grace used cabin aeroplanes she did so almost entirely out of consideration for her pilots.

By her example the Duchess of Bedford did a very great deal to popularise flying, not only because of her many tours with such pilots as Barnard and Preston, but even more by her personal gift of sensing the kind of trip which would be "worth while." One of her favourite pastimes was to get among and above the clouds to admire in perfect peace the marvellous formations and colours there to be found. On one occasion she went up with her pilot in a Moth to 10,000ft. or so to see an eclipse of the sun; and she *did* see it. "It is," she said, "fortunate that there is not to be another eclipse for 200 years, for obviously the sun was very cross about it, as he has hardly been seen in England since."

Mary, Duchess of Bedford, must now, alas, be presumed to have made her last flight. Her friends will feel that she would have preferred the end to come during the pursuit of the pastime she loved so well.

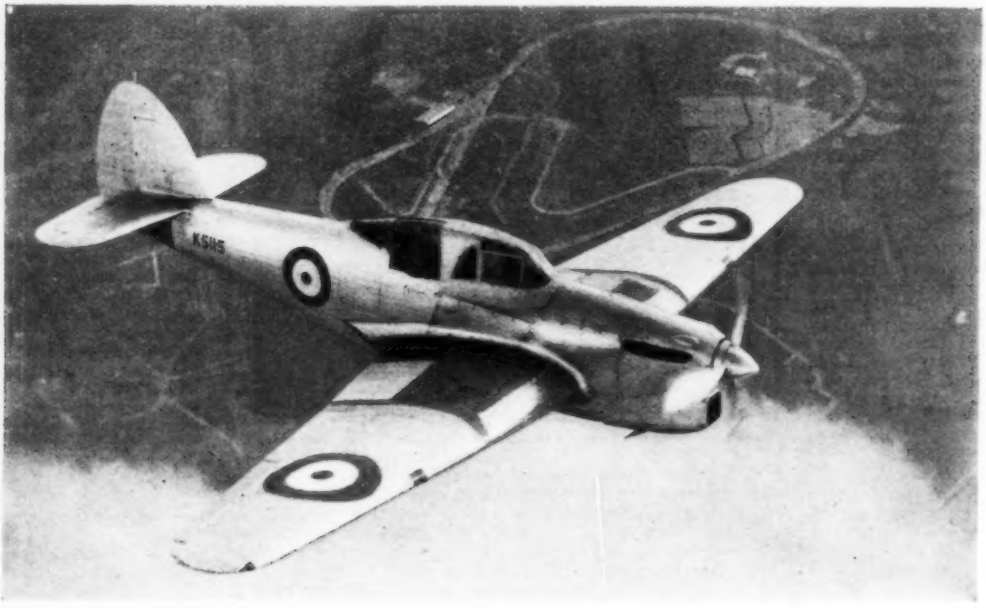
Forthcoming Events

April 3. Rugby: R.A.F. v. Army, Twickenham.
April 6. R.Ae.S. Students' Section Debate: "Speed v. Safety," 7 p.m., R.Ae.S. Library.
April 8. R.Ae.S. Lecture*: "Control Problems," by Mr. A. G. Pugsley.
April 10. Aero Golfing Society: Martlesham Match.
April 15. R.Ae.S. (Coventry Branch) Lecture: "Production and Inspection Methods Applied to Screw Threads," by S. J. Harley. Armstrong Siddeley Canteen, 8.15 p.m.
April 15. Italian Aero Club: Sahara Rally.
April 22. R.Ae.S. Lecture*: "Power Plant Trends," by Mr. G. J. Mead.
May 6. Aero Golfing Society: Instone Trophy.
May 9. R.Ae.S. Garden Party, Great West Aerodrome, Hayes.
May 12-19. Austrian Aero Club: Austrian Whitsun Flight.
May 13. Leicester Airport Coronation Air Display.
May 15. Cardiff Aero Club: Coronation Rally.
May 15-18. Yorkshire Gliding Club: Whitsun Meeting, Sutton Bank.
May 26—June 6. Brussels Aero Show.
May 26-30. Austrian Aero Club: Salzburg Gliding Contest.
May 27. R.Ae.S. Wilbur Wright Lecture: "Turbulence," by Dr. Theodor von Karman. Science Museum, South Kensington.
May 29. Empire Air Day.
May 29-31. London-Isle of Man Race and Round-the-Island Contests.
June 4-6. York and Leeming F. Clubs: International Meeting, York.
June 11-14. Hungarian Aero Club: International Conference.
June 12. Bristol and Wessex Aeroplane Club: Garden Party, Whitchurch.
June 15-20. Magyar Pilota Picnic, Hungary.
June 20. R.Ae.C. of Belgium: Gordon Bennett Balloon Race, Brussels.
June 21-28. Federation Aeronautique Internationale: London Conference.
June 26. Royal Air Force Display, Hendon.
June 28. S.B.A.C. Display, Hatfield.
July 1. Aero Golfing Society: *Flight* Trophy.
July 3. Newcastle-on-Tyne Aero Club: London-Newcastle Race.
July 3. Ramsgate Airport, Official Opening.
July 4-18. Aero Club of Germany: Wasserkuppe Gliding Meeting.
July 10. Cardiff Aeroplane Club: London-Cardiff Race.
July 11. Italian Aero Club: Circuit of Rome.
July 15. Aero Golfing Society: Jubilee Cup.
July 17. Portsmouth Aero Club: Garden Party.
July 23—August 1. Swiss International Meeting.
July 24. Devon Air Day and Race: Plymouth, Exeter and Haldon.
July 31. Cinque Ports Flying Club: Folkestone Aero Trophy Race.
July 31—August 2. Yorkshire Gliding Club: Opening Meeting. Sutton Bank.
August 1-14. Yorkshire Gliding Club: Instructional Camp Sutton Bank.
August 1-31. New York—Paris Air Race Flights.
August 3-September 7. Public Schools Aviation Camp, Norwich.
August 6-7 Austrian Aero Club: International Rally, Lake Worth.
August 14-22. Yorkshire Gliding Club: Open Contest, Sutton Bank.
August 21. Thanet Aero Club: Aviation Meeting and Race.
August 21. Midland Aero Club: "At Home."
August 22-29. Italian Aero Club: Circuit of Littorio.
August 28 and 29. Cinque Ports Flying Club: Lympne International Rally and Wakefield Trophy Race.
September 10-11. R.Ae.C.: King's Cup Race.
September 12. Aero Club de France: Coupe Deutsch de la Meurthe, Etampes.
September 23. Aero Golfing Society: Cellon Trophy.

* These lectures take place in the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission is by ticket obtainable through a member

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS



P.4/34 PROTOTYPE : Hawker's answer to an Air Ministry request for a high-speed light bomber. The engine is a Rolls-Royce Merlin which, as will be noted, has the new type of combined glycol radiator, oil-cooler and air intake. New streamlined exhaust collectors are also incorporated. The cockpit enclosure is one of the neatest of its kind yet seen. Brooklands Track will be recognised below. (*Flight* photograph.)

NEW SQUADRONS FORMING

No. 240 (Flying Boat) Squadron formed at Calshot on March 30, 1937, and was placed on the Coastal Command in No. 16 (Reconnaissance) Group.

The formation of No. 76 (Bomber) Squadron at Driffield, which was to have taken place on March 15, has been deferred.

MOVES OF SQUADRONS

No. 44 (Bomber) Squadron has moved from Wyton to Andover.

Nos. 51 (Bomber) and 58 (Bomber) Squadrons were moved from Driffield to Boscombe Down.

No. 80 (Fighter) Squadron has moved from Kenley to Henlow.

No. 226 (Bomber) Squadron has moved from Upper Heyford to Usworth.

No. 43 SQUADRON DINNER

It is proposed to hold a reunion dinner for all past and present officers of No. 43 Squadron, to celebrate the 21st anniversary of its formation. The dinner will be held on Friday, April 16, at the Savoy Hotel, London, at 7.30 p.m. for 8 p.m. Tickets are 12s. 6d., wines excluded. All officers wishing to attend are asked to communicate with P/O. J. W. C. Simpson, R.A.F., Tangmere, Sussex.

NAMES OF AIRCRAFT AND ENGINES

The name of the Bristol bomber transport aeroplane is Bombay I.

The name of the new Rolls Royce 12-cylinder "vee" ethylene-glycol cooled aero-engine about to be introduced into the service for installation in the Battle aeroplane is the Merlin I.

The name of the Rolls-Royce 12-cylinder "vee" ethylene-glycol cooled aero-engine about to be introduced into the Service for installation in the Spitfire and Hurricane aeroplanes is the Merlin II. This engine is similar in general construction and performance to the Merlin I, but embodies a modified form of cylinder block.

NEW AIRCRAFT-CARRIER

The new aircraft-carrier *Ark Royal* will be launched at the works of Cammell, Laird and Co., Limited, Birkenhead, on Tuesday, April 13.

FOREIGN OFFICER WITH THE R.A.F.

Engineer Lt K. Okuda, of the Japanese Naval Air Service, has been attached to No. 2 Flying Training School in order to study the organisation and work carried out by the unit.

TRANSFER OF OFFICERS TO THE RESERVE

The undermentioned short service and non-permanent officers should note that they become due for transfer to the reserve, or (where indicated) for relinquishment of commission, in August and September next:—

General Duties Branch

Flt. Lts. *Horace Roy Allen, Henry Lawrence Matthews Glover, *Cyril Nelson Carpenter, *Peter Bathurst, *Alan Allnutt Saw, *John Henry Abel Chapman, *William Leigh Houlbrook, *Donald Andrew Gibson.

Medical Branch

Flt. Lt. Herbert Fenwick Harvey, M.B., B.S.

Dental Branch

Flt. Lts. Harold Keggin, L.D.S., and Victor Harry Weeks, L.D.S.

Chaplains Branch

†The Revd. Charles Percy Nott Rowband, M.A.

†To relinquish commission, not liable for reserve service.

The officers marked * have been selected provisionally for permanent commissions.

No. 31 SQUADRON DINNER

It is proposed, if sufficient support is forthcoming, to hold a dinner in London on Saturday, May 29, for past and present members of all ranks of No. 31 (A.C.) Squadron who were on the strength of, and actually serving with, the squadron during the Quetta earthquake on May 31, 1935. Those officers and airmen who would wish to attend should communicate at an early date with Sqn. Ldr. R. M. C. Macfarlane, M.C., Harborough, Waverley Road, Farnborough, Hants.

ROYAL AIR FORCE DINNER CLUB

It has been agreed, owing to the inconvenience involved for many members, that it is no longer possible to hold the annual dinner on the eve of the Royal Air Force Display. It has been decided, in principle, to change the date to the eve of the Royal Air Force *v.* Army Rugby match which usually takes place on the last Saturday in March. For 1937, owing to the proximity of this date (actually April 3) to the last dinner, and because there is little time to make the arrangements, the sixteenth annual dinner will be held at the Connaught Rooms on Friday, October 22.

No. 3 SQUADRON, ROYAL NAVAL AIR SERVICE

The annual dinner of No. 3 Squadron, Royal Naval Air Service (1914-1918), will be held at the Falcon Hotel, Fleet Street, London, at 7 p.m. on Saturday, May 1. The chair will be taken by Captain L. H. Rochford, D.S.C., D.F.C. Tickets, 5s. each, and further particulars may be obtained on application to Mr. P. W. Bingham, 116, Riverview Gardens, London, S.W.13.

FLYING ACCIDENTS

The Air Ministry regrets to announce that Lt. Christopher Blomfield Jelf, Royal Navy (Flying Officer, Royal Air Force), lost his life as the result of an accident which occurred off Bembridge, Isle of Wight, on March 22, to an aircraft of No. 800 (Fleet Fighter) Squadron, embarked on H.M.S. *Courageous*. Lt. Jelf was the pilot and sole occupant of the aircraft.

The Air Ministry regrets to announce that A/C.1 Ronald Walker lost his life as the result of a collision in the air which occurred at Amman on March 23 between two aircraft of No. 14 (Bomber) Squadron, Amman, Trans-Jordan. A/C.1 Walker was the passenger of one aircraft. The pilot of that aircraft, Flt. Lt. Michael Arthur Aylmer, safely descended by parachute and was not injured. The occupants of the second aircraft are safe and uninjured.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch.

Wing Commander.—R. Harrison, D.F.C., A.F.C., to No. 78 (Bomber) Squadron, Dishforth; to command, 8.3.37.

Squadron Leaders.—J. A. Gray, D.F.C., to No. 23 (Training) Group Headquarters, Grantham; for air staff duties, 14.3.37. E. J. Kingston-McCloughry, D.S.O., D.F.C., to R.A.F. College, Cranwell; for duty as Chief Ground Instructor, 14.3.37. J. H. Powle, to No. 108 (Bomber) Squadron, Upper Heyford; to command, 15.3.37.

Flight Lieutenants.—R. H. W. Empson, to R.A.F. Depot, Uxbridge, 12.3.37. C. Ryley, to R.A.F. Depot, Uxbridge, 11.3.37. H. B. Collins, to No. 825 (Fleet Spotter Reconnaissance) Squadron, 12.3.37. K. Lea-Cox, to No. 226 (Bomber) Squadron, Upper Heyford, 15.3.37. G. W. Heather, to R.A.F. Station, Cranwell, 11.3.37. C. E. S. Lockett, to No. 52 (Bomber) Squadron, Upwood, 15.3.37.

Flying Officer.—M. H. de L. Everest, to No. 226 (Bomber) Squadron, Upper Heyford, 15.3.37.

Pilot Officers.—V. S. Butler, T. F. Harvey, T. M. Hunt, R. G. Hurst, A. L. Pitfield, N. N. Thomas, and D. G. Warren, to No. 226 (Bomber) Squadron, Upper Heyford, 15.3.37.

Acting Pilot Officer.—G. R. Brady, to No. 226 (Bomber) Squadron, Upper Heyford, 15.3.37.

Equipment Branch

Squadron Leader.—A. Walters, to No. 4 Equipment Depot, Ruislip; for equipment duties, 15.3.37.

Flight Lieutenant.—T. A. Head, to R.A.F. Station, Waddington, 12.3.37. F. W. Felgate, to Directorate of Equipment, Air Ministry, 11.3.37.

Accountant Branch

Squadron Leader.—W. J. Heneghan, to Headquarters, R.A.F., Mediterranean, Malta; for duty as Command Accountant, 1.3.37.

Flight Lieutenant.—C. E. Hunter, to R.A.F. Station, Ramleh, Palestine, 22.2.37.

Flight Lieutenants.—J. MacL. Murray, to R.A.F. Station, Harwell, 12.3.37. F. Rigby, to R.A.F. Station, Waddington, 12.3.37.

Flying Officer.—C. G. Sharp, to R.A.F. Station, Feltwell, 12.3.37.

PRIVATE FLYING REVIEWED

Sound Progress Reported at Annual Meeting of R.Ae.C.

PRIVATE flying formed an important section of the speech made by Mr. W. Lindsay Everard, M.P., who took the chair at the annual general meeting of the Royal Aero Club on March 24. Steady progress in every direction was reported, and the interesting fact was disclosed that during the past year 2,447 new "A" licences were taken out, as compared with 1,368 the previous year. The number of "B" licences was 178 as against 175 the previous year. Some idea of the growth of private flying was also provided by the announcement that the "A" licences current at the end of 1936 numbered 4,356, and perhaps even more surprising was the fact that the corresponding "B" licences numbered 736. During the past year 1,144 Aviators' Certificates were granted. In 1935 the number was 955. The total number of aircraft on the register at the end of 1936 was 1,682 compared with 1,535 during the previous year. Of these 668 were privately owned.

There can be little doubt that the growing popularity of private flying owes much to the clubs, 36 of which are now represented on the General Council of Affiliated Light Aeroplane Clubs and to the efforts made by the R.Ae.C., in collaboration with the F.A.I., to obtain greater facilities for air touring abroad. The chairman recalled that the scheme by which members are afforded free landing and hangarage facilities for 48 hours was at first supported by very few countries, whereas now, almost every European country is a party to this arrangement. In this connection mention should also be made of the new simplified Carnet for air touring abroad, brought into being by the R.Ae.C. through the F.A.I. The whole subject of Carnets is now, the chairman said, under consideration with a view to reducing to a minimum the many formalities at present in force. Negotiations with governments were always tedious, Mr. Lindsay Everard said, but they were hopeful that their efforts would be successful.

All matters relating to air touring are dealt with by a joint standing committee of the R.Ae.C. and the A.A., and the chairman recalled that in view of the increasing amount of work which this section of the club's activities had brought about, Sq. Ldr E. H. D. Spence had been appointed to assist Lt. Cdr. Perrin.

Mr. Lindsay Everard also announced that the club had taken the British Gliding Association under its wing, with Lt. Cdr. Perrin as its secretary. During the past year the R.Ae.C. issued the following Gliding Certificates: 116 "A," 87 "B," and 78 "C." A national record of 105 miles was established during 1936 by Mr. P. A. Wills on a Hjordis sailplane.

In connection with the conference of the F.A.I. to be held in London from June 22 to June 28 next, the chairman announced that an attractive programme of entertainment had been arranged, including an official banquet by the Government, a reception by Sir Philip Sassoon, a cocktail party given by Lord Londonderry and, of course, the R.A.F. and S.B.A.C. Displays.

Finances

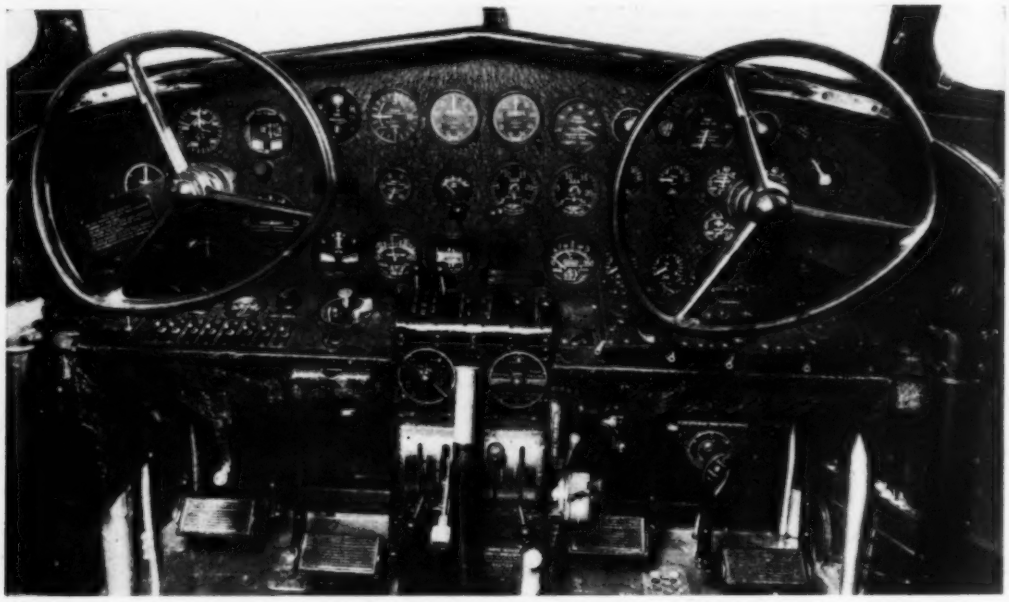
Mr. Lindsay Everard recalled that three years ago they called on members to subscribe for £20,000 debentures for the provision of the clubhouse. The full amount was subscribed. As a result of the efforts of the the chairman of the finance committee (Mr. F. Handley Page) a sum of £10,848 in the way of debentures had been presented to the club for the advancement of private flying and for the creation of a staff pension fund.

At the meeting the following were elected: President, The Duke of Atholl; Vice-Presidents: The Duke of Sutherland, the Marquess of Londonderry, Viscount Wakefield of Hythe, Lord Gorell, and Lt. Col. Mervyn O'Gorman.

The following nominees to the nine vacancies on the committee were elected: Mr. A. J. A. Wallace Barr, Cmdr. James Bird, Flt. Lt. C. Clarkson, Lt. Col. M. O. Darby, Lord Gorell, Capt. A. G. Lamplugh, Lt. Col. Sir Francis McClean, Mr. F. Handley Page and Mr. G. H. Wilson-Fox.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



COMPLETE EQUIPMENT : The dashboard of one of British Airways' Electras, which are shortly to go into service. Behind the port wheel can be seen the Lorenz blind-approach dial, a radio homing indicator and the normal Sperry equipment. Behind the port throttle lever is the exhaust gas analysing indicator—especially necessary with constant-speed airscrews.

THE WEEK AT CROYDON

The Easter Exodus : De-icing : Mysterious Cavalcade : More About "All-weather Pilots"

FIGURES, when sorted out, will probably show that this Easter has broken all previous records in the air. Day after day all services have been full up, and a large number have been duplicated. Swissair's Zurich line, as usual, has been very popular, and for two or three mornings in succession the K.L.M. 8 a.m. service has consisted of the big F.36 and a Douglas, giving a capacity of 46 passengers.

Among travellers this Easter have been Mr. and Mrs. Winston Churchill, the Prince of Pless, Mr. H. G. Wells (mourning the fact that air transport has not turned out as he predicted many years ago), and last, but not least, except in inches, five-year-old Miss A. M. Doyle Davidson, travelling alone to Amsterdam to visit her parents.

All the air charter firms have been (literally) rushed off their feet into the air with every available machine and pilot, and one of Olley Air Service's most popular pilots told me he hardly knew what country he was in until a native spoke to him towards the end of a day of crossing the Channel time after time on various charter jobs. The Le Touquet services operated by Imperial, Olleys and Air Dispatch have been amazingly busy, and Personal Airways, too, have been much more in the air than on the ground. Mr. Jack Wilson, one-time test pilot to Rollasons, has just returned from Nairobi in a Stinson, and Flt.-Lt. Llewellyn was seen to arrive from Hatfield with his Percival Vega Gull.

British Airways, Ltd., gave a demonstration of their two new Lockheed Electra aeroplanes [as recorded on page 333,—ED.], of which five have been ordered, at Croydon on March 24. British Airways thus have the fastest craft on the aerodrome at the moment, though K.L.M. has also ordered Lockheeds, Super Electras in this case, with fourteen seats, Wright Cyclones, and a cruising speed of around 240 m.p.h.

A good deal of nonsense is being talked in Parliament and elsewhere about de-icing plant, some people being of the opinion that it is a sovereign remedy against all aeronautical ills. The fact is that, whilst pilots who have experience of it report favourably, the whole matter is still by way of being experimental, nor is it a fact that all foreign aircraft are fitted with such equipment. Imperial Airways are experimenting, in common with the rest of the big air transport concerns, but, as far as I know, have not yet found an entirely satisfactory system, and thus it would be absurd to start fitting a large fleet with such equipment.

The Grand National, the Boat Race and Easter, following hard upon one another's heels this year, gave air charter companies plenty of work, and I hear that over that period Irish Sea Airways have been carrying full loads and have made up for the period when snow put the line temporarily out of action.

Occasionally at Croydon nowadays one sees an amazing procession. First comes an elderly man moving with the deliberation of a slow-motion film. Sometimes he warns airport crows, beetles and slugs to get out of the way by waving a red flag at them. Next comes a lorry of sorts

moving almost imperceptibly, and behind it is towed, tail-first, what seems to be an exact replica of the *Rocket*, belching black smoke not only from its funnel but from numerous chinks in its armour as well. It is, in Customs parlance, "said to contain tar." No mortal man knows what the object of this procession is, for although it sets out at dawn from one side of the aerodrome it still has by far the major part of its journey to complete when night falls, and the last thing one sees before darkness overtakes the scene is the brisk, night-hunting slug rushing up behind the procession, passing it and disappearing with a derisive flick of the tail.

In the early days of civil aviation certain pioneer pilots made some amazing bad-weather flights, especially notable because aeroplanes and engines were less reliable, wireless was non-existent, instruments were poor, and, in fact, everything depended upon the wisdom and skill of the pilots. The reason why such flights were made was that it was necessary to convince the public that flying was no mere flimsy, fine-weather business, but a serious and regular form of transport. So ably did the pioneers perform their task that individual pilots were honoured by Press and public alike with nicknames such as "All-weather McIntosh," and so on. What was done in those days was necessary for the establishment of air transport, and we may be grateful to such pioneer pilots, to whom our present assured position is, in a large degree, due. Ask any of the old hands, however—Rogers, Smirnoff, McIntosh, Geisendorffer, and the rest—whether they would do to-day what they did in the old days with the same material and facilities. The answer will be "No!" and it will, in effect, if not in actual words, echo my remark of a week or so back that there are no "all-weather pilots" to-day. The necessity no longer exists. The best airline pilots of to-day are those who know when not to fly, and the best airline pilots to-day, incidentally, are those who were the dashing pioneers of yesterday. Comparatively rare though cancellations of services are, you may be sure that when one of the old hands decides not to fly the decision is a sound one. Incredible though it may seem, the few words I wrote about this matter were taken by some to cast some mysterious slur on the pioneers, and particularly on Capt. McIntosh, whose name I mentioned as an outstanding example. A. VIATOR.

Newfoundland Preparations

THE radio station at Botwood is now completed and in operation. It has even been heard in England on several occasions, and it is understood that the operator was in touch with *Cambria* during her circuit of Great Britain.

Work will shortly be resumed on the airport at Hattie's Camp. This should be ready in September, but at least one runway will be serviceable by the end of June.

Internal Expansion in India

THE introduction of the Empire air mail scheme should do a great deal to assist internal airline development in India.

The number of Indian National Airways' services between Karachi and Lahore, for instance, will be increased to five weekly, so bringing the chief airport of India and the seaport serving the Punjab in close contact with the North of India. To start with, this service will only carry mails and urgent freight. Re-equipment with faster machines will enable the route to be operated in daylight, and the company will then cater for passengers.

France and the Atlantic

AS anticipated in these pages a few weeks ago, Air France, in co-operation with the Compagnie Generale Transatlantique, were the only candidates to respond to the Air Ministry's recent invitation for North Atlantic tenders. It was officially announced last week that their tender had been successful, and, as a result, a new firm will immediately prepare for experimental flights.

It is stated that the *Lieutenant de Vaisseau Paris*, which has been completely rebuilt, will be the first machine to carry out trial flights, while a four-engined Farman is also being prepared. Although it is too early to make a definite statement, it is regarded as probable that the Lioré et Olivier 47 flying boat, five of which have been ordered by Air France in addition to the prototype, may also be tried over the longer ocean crossing. Its tests when carrying a ton overload showed a top speed of 228 m.p.h., while a range of more than 3,500 miles brings the North Atlantic well within its capabilities.

British Airway's Electras in Action

TWO of the five Lockheed Electras ordered by British Airways for their Scandinavian service have now been delivered, and last week some demonstration flights were given to a party of guests.

The great merit of these machines is, of course, their high speed, and when one wants to get to Denmark or Sweden the great thing is to get there quickly. From the passenger's point of view, the comfort is reasonable, though hardly up to the latest standards. The ten seats are on the narrow side, and a bulky passenger might feel cramped, though there is plenty of leg room. The roof is low, but once one has taken one's seat that does not matter. Low-wing monoplanes are always apt to restrict the view from some seats, but the two rear seats on each side in the Electra give quite a good view behind the wings. British Airways state definitely that these machines are only looked on as stop-gaps until suitable British aeroplanes are available.

Weather Broadcasts

A CHANGE in frequency has been made at Borough Hill, whence the Air Ministry broadcasts weather reports. These will now be transmitted on 255 kc/s (1,176 m.) instead of 254 kc/s (1,181 m.).

New Scandinavian Services

ON April 4 Swedish A.B.A. will open the Copenhagen-Oslo service, which will, later in the season, be taken over by D.L.H. Norwegian D.N.L. will put their Sikorsky on the service in co-operation with A.B.A. D.N.L. is also expected to open a line between Oslo and Stockholm this summer—using flying boats. Two internal Norwegian air lines will shortly be opened between Oslo, Stavanger and Bergen to connect with the projected Stavanger-Newcastle service.

Trans-Canada

ON March 22 Mr. Howe, the Minister for Transport in Canada, introduced a Bill for the establishment of the trans-Canadian air service. By its terms a new company, known as Trans-Canada Air Lines, will be formed with capital of £1,000,000. The stock will be dealt with by the Canadian National Railway, which will distribute it to any operating companies which hope to participate in the service.

After 1939 mails will be carried on a contract basis, but until that time the Government will supply a cash subsidy for the operations.

The "Capricornus" Disaster

OF six occupants, consisting of a crew of five and one passenger, only one survived when Imperial Airways' tenth Short Empire boat crashed on the afternoon of March 24 two miles from Ouroux during her maiden flight. In many ways it is fortunate that the one survivor should have been an active member of the crew—only in such circumstances is it possible to gather real information about an air accident and to learn lessons which will help to prevent a repetition of such a catastrophe.

Capricornus, as the machine was called, left Hythe at 11.30 a.m. and was making for the usual alighting place on the Saône at Mâcon. Her last clear wireless message was transmitted at 2.10 p.m., when the operator told Bron, Lyons, that they were flying in a heavy snowstorm with ice forming on the wings, and asked for a position. The machine struck a hillside at 2,200 ft. when flying some twenty miles to the south-west of Mâcon. Capt. A. Paterson, First Officer C. E. Klein, Mr. D. R. O'Brien, the flight clerk, and Mr. F. A. E. Jefcoate, the steward, were killed, and the only passenger, Miss B. M. Coates, died later. The radio operator, Mr. J. L. Cooper, escaped with minor injuries, but managed to make his way to Ouroux to obtain assistance.

Capt. Paterson was one of that select band of pilots who have worked themselves from the ground to the air. Originally on the engineering side with Imperials, he became a first officer some five years ago. After flying on the London-Paris route he went East to fly boats and was naturally selected to command one of the new Empire fleet.

Commercial Aviation

North-Eastern Extension

ON April 5 North-Eastern Airways' Croydon-Perth Service will be extended to Aberdeen. Dyce airport, therefore, will be the northern terminus of the service; stops will be made, as before, at Newcastle, and at Leeds and Doncaster as traffic demands. This extension is interesting in view of the projected Aberdeen-Stavanger service.

Coping with Traffic

IT is likely that the demand for airline accommodation between London and Paris will be very great this summer, and operators may find it difficult to cope with the traffic. Air France are not expecting their 40-seaters before midsummer, and it is interesting to learn that the Douglas—which was purchased more than a year ago by the French Air Ministry and has for several months been reposing in the corner of a hangar at Villacoublay with its two engines missing—is to be brought back into commission and handed over to Air France.

Pacific Test

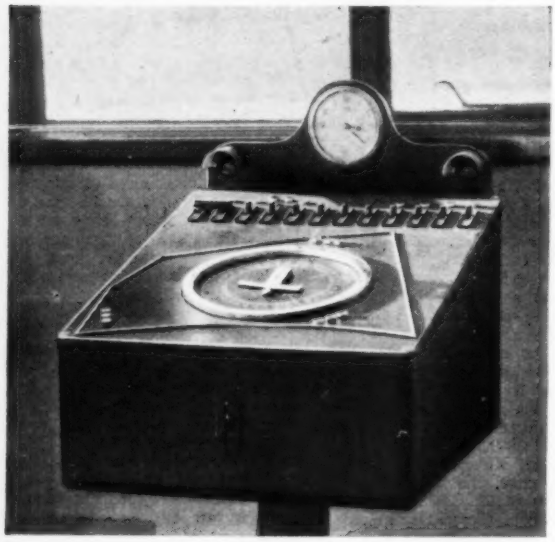
THE first survey flight over the route for the projected service between the United States and New Zealand is now being made. A. P.A.A. Clipper flew first to Honolulu and thence to Kingman Reef—a non-stop flight of 1,067 miles which was covered in 8 hr. 5 min. by night. The next stop was Pago-Pago (American Samoa), and thence the machine will fly non-stop to Auckland, New Zealand.

Although this flight has so far been carried out without any obvious hitches, it should be remembered that the groundwork for this and for the Northern Pacific route was started as long ago as 1935.

Nine Are Flying

A NUMBER of people have a direct or indirect interest in the progress of the new Empire boats. For their benefit we may say that nine boats are now in action. These are:—*Canopus* (ADHL), *Caledonia* (ADHM), *Cavalier* (ADJU), *Castor* (ADUM), *Centaurus* (ADUT), *Cambria* (ADUV), *Cassiopeia* (ADUX), *Capella* (ADUY), *Cygnus* (ADUZ). The tenth to appear was the ill-fated *Capricornus* (ADVA).

Caledonia and *Cambria* are, of course, special long-range machines, while *Cavalier* is, from all accounts, loafing about at Bermuda awaiting a decision concerning the position of the American base. The next four machines to come out will be *Corsair, Courtier, Challenger* and *Centurion*. Judging from the order of registration these will be ADVB, —VC, —VD and —VE respectively.



REMOTE CONTROL: An interesting example of lighting-control panel design is that installed at Newcastle Airport by Clarke, Chapman & Co. Within the boundaries of the "model" airport, with its three floodlight repeaters, is a wind-tee repeater; in calm conditions this may also be used to set the outside tee in any definite position.

Survey in Africa

IN last week's issue some details were given of a Double-Eagle which is being built at Hanworth for survey work in Africa. This work is being carried out by the Aircraft Operating Co., of Africa (Pty.), Ltd., which is also an associated company of H. Hemming and Partners, Ltd.

Airship Schedules for 1935

ON the evening of Monday, May 3, the airship *Hindenburg* leaves Frankfort for her first scheduled service to Lakehurst. Crossings will be made every ten days or so until the end of October. She has already completed one trip to South America. The baggage allowance has been increased to 30 kilos., and the rest of one's luggage, up to 100 kilos., may be forwarded free by steamer.

Preparing for the Next

THE Imperial School of Air Navigation have entered forty students for the Second-Class Navigators' examiination to be held by the Air Ministry in April. As far as we know this constitutes a record for any one school. The next day-term begins April 19. The percentage of failures at this school has averaged approximately 10 per cent. since it was opened in 1935.

Improvements at Bristol

IT is expected that the Air Ministry meteorological station will be opened at Bristol on about May 1, the staff consisting of a meteorological officer with three assistants. Coupled with the existing radio station and teleprinter communication, the new unit will provide a long-awaited aid in the west of England.

The Corporation, incidentally, have asked Norman and Dawbarn to prepare plans for the extension and improvement of the Whitchurch landing area, and for new administrative and control buildings which will eventually be built at the northern end of the aerodrome.

An American Disaster

CONFLICTING reports make it difficult to guess at the reasons behind the accident to a T.W.A. Douglas, which occurred some ten miles from Pittsburgh, Penn, and in which all the thirteen occupants were killed. The pilot of a following machine is stated to have said that the weather conditions were perfectly good and that the machine simply dived vertically into the ground. Other reports speak (inevitably) of ice formation.

Steward Jefcoate

A FEW weeks ago (writes "A. Viator") when the late Steward Jefcoate (killed in *Capricornus*) was promoted to service on the big Empire flying boats, with a view to becoming a Ship's Clerk, I wrote a word or two of appreciation of his work as an air steward. My words have been echoed and elaborated by an entirely unbiased obituary notice sent to *The Times* by an unknown passenger, which I take the liberty of quoting here:—

"He was my first steward and my last; and in some 12 years of flying, by some strange chance, it was almost always Jefcoate who served the aeroplane by which I happened to go. It was for me a happy chance. Probably few passengers knew him by name; still fewer of those he served will forget the quiet, dutiful man—always considerate, always point-device—moving in his gangway above the clouds as a good club-servant moves about the smoking room. He had the secret of adaptability. The nervous old lady, the excited 'first-timer,' the little boy travelling alone, the animal committed to his care—all were better for his company. No matter how rough the passage of the old three-engined Argosy, Jefcoate's demeanour put thoughts of danger to shame; looking upon him, all knew that there was nothing to fear. The idle, well-worn question that he had answered before a thousand times always received the same respectful reply. I have heard him whisper to a small stranger 'Look out of your window, Sir. That's one of our new aeroplanes—the one going up to the hangar. When you're through the Customs, if you'd like to see her close up, I'll be by the door.' And once, when an Alsatian was frightened, Jefcoate did for that dog everything that a man can do. And now he has done his duty for the last time."

The epitaph which Steward Jefcoate's friends at Croydon will perhaps find most apt is a short one. "Well done, thou good and faithful servant."

MODELS

A Promising Wakefield Cup Design : Club News : A Useful Handbook

By M. R. KNIGHT

Mr. C. A. Rippon's Wakefield Cup model. It is of 43 in. span, and the workmanship is of an extremely high order.

The "Duracruiser"

CONSIDERABLE activity is centred on the production of models to the 1937 Wakefield Cup formula, and several have now made their first flights. Among them is Mr. C. A. Rippon's *Duracruiser*, a cabin high-wing monoplane with divided, strut-braced wings, tapered and swept-back, and an unusually low thrust-line. With a wing area of 210 sq. in., a span of 43 in., and an overall length of 34, the total weight is 8½ oz. A vast amount of thought has been expended on the detail design, with the result that potential causes of trouble have been anticipated and guarded against. Aerodynamically and structurally, therefore, the machine is of exceptional interest.

The fuselage consists of six longerons of ⅛ in.×⅛ in. hard balsa, cross-pieces and the diagonal bracing in the top and bottom of the same material, and bulkheads formed from pieces of 1/16 in. balsa sheet, their mitred corners reinforced. Two pieces of thick celluloid form the cabin, and are stress-bearing. Front and rear bays are reinforced with balsa sheet. The maximum width is 3 in., and the depth 5 in., of which the cabin accounts for 2 in. The thrust-line is 2 in. from the bottom of the fuselage.

Each wing is 20 in. in span, tapers in chord from 6¼ in. to 3½ in. and has an aileron 6¼ in.×1¾ in. set at a negative angle. The trailing edge is backswept 17 degrees, and there are 8 degrees of dihedral. The wing-section is RAF 28. Though not the most efficient aerodynamically, this form of wing has proved highly effective, particularly in securing a clean take-off. A single length of 3/32 in.×⅛ in. bamboo is used for the wing and aileron outline, and this is reinforced with shaped balsa to form the tapered leading edge. There are two spars of 1/16 in. balsa, tapering in depth from ⅜ in. to ¼ in., and the ribs of 1/16 in. balsa are spaced 1 in. apart. The ailerons, which are hinged with aluminium, are built and covered integral with the wing, and then separated. Each wing is braced with a vee strut consisting of three spars of 1/32 in. × ⅛ in. spruce, covered on each side with 1/32 in. balsa.

Rubber bands pass through the strut from hooks on the fuselage to swivelling hooks mounted on a bamboo peg in the wing, thus securing the necessary "anti-crash" flexibility without any tendency to fracture. Two prongs of 20 s.w.g. wire on each wing plug into holes in a ⅛ in. birch plywood strip cemented to the top longerons, and rubber bands passing over the fuselage are anchored to hooks on each wing. The struts are similarly secured to the bottom of the fuselage. Additional holes permit a variation in longitudinal trim.

The detachable undercarriage comprises two struts and an axle of bamboo, sprung by means of rubber bands passing from hooks on the struts through streamlined tubes of rolled and gummed parcel tape, to hooks on the fuselage. The 2½ in. wheels are of balsa.

The tail-plane is 18 in. in span, the backswept leading edge tapering the chord from 5 in. to 2⅜ in. The fairly thick section has a flat under side. Bamboo is used for the edging, and 1/16 in. balsa for ribs and main spar. The fin is 7 in. high and 6 in. wide, and consists of 1/16 in. balsa ribs threaded on a spar of the same material and bamboo edging. Prongs of 20 s.w.g. on the tail-plane trailing edge push through holes in a plywood panel on the fin, and into the sternpost. A wire saddle on the front of the fin slips over bamboo prongs on the tail-plane leading edge, and is secured by a rubber band around the fuselage.

"Mikasa" tissue is used for all covering. The workmanship, as one would expect, is perfect. At present the motor is a single skein (14 strands) of ¼ in.×1/30 in. rubber, anchored to a bone peg in the rear of the fuselage, but provision is made for the installation of gearing and for the use of a twin winder at the sternpost. The symmetrical airscrew is 16 in. in diameter, 20 in. in pitch, and 2 in. in blade width, with a free-wheel device in front. There is no rubber-tensioner. With the wings at 4 degrees positive incidence, the tail neutral, and the thrust-line parallel with the tail, stability and performance have proved highly satisfactory.

S.M.A.E. Contests in April

DURING April two open contests will be held on the grounds of clubs affiliated to the S.M.A.E. Next Sunday, April 4, the Gamage Cup will be competed for on the basis of the best average of three R.O.G. flights by any type of rubber-driven model. On April 18, the Pilcher Cup will be awarded for the best average of three R.O.G. flights by models conforming to the 1937 Wakefield formula.

Belfast on the Air

LITTLE has hitherto been heard of model aviation in Ireland, but an interesting letter from Mr. H. R. Johnson gives news of what is believed to be the only club of its kind in Northern Ireland, the Belfast M.F.C., of which he is hon. secretary. An interview with the Founder-President, Mr. J. Black, was recently broadcast from Northern Ireland.

Rallies

THE 1937 "Northern Heights" Gala Day has already been announced to take place at Fairey's Great West Aerodrome on June 20.

On May 17 a Rally open to all clubs will be held by the Romford M.A.C., at Maylands Aerodrome. Details from Mr. J. S. Wreford, "Middlecot," Redden Court Road, Harold Wood, Essex.

The progressive Lancashire Model Aircraft Society will hold their "Northern Rally" on June 6.

The M.A.C. Grand Rally will take place at Wimbledon during September.

A Valuable Handbook

FRANK ZAIC'S *Model Aeronautics Year Book* has won a high reputation and, apparently, a circulation large enough to justify increasing the size of the 1937 Edition from 74 to 160 pages. It is a mine of information on theory and practice, the subjects dealt with including various aspects of stability, low-speed aerodynamics, choice of aerofoils, fixed and free-wheeling airscrews, and the effect on design of the new weight rule. Capt. C. E. Bowden contributes a chapter on petrol model problems, and there is even an account of radio control experiments. Plans are given of seventeen outdoor rubber-driven fuselage models, including A. Judge's Wakefield winner, and F. Rogerson's fascinating biplane, winner of the Canadian Wakefield Trophy. The eighteen petrol-plane designs include a flying-boat. Gliders, outdoor "spars," and indoor models bring the number to 81. Every serious modeller should possess a copy, which can be obtained from model stores, or 4s. 3d. post free from Mr. C. S. Rushbrooke, "Innsbrook," 14, Ennerdale Drive, Aston-on-Mersey, Sale, Cheshire.

THE INDUSTRY

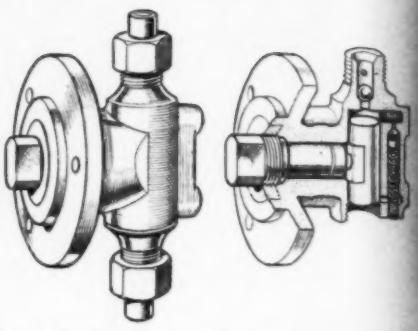
Universal Providers

IT is not easy to describe the general products for the aircraft industry produced by Rotherham and Sons, Ltd., of Coventry, for in addition to their great variety of standard unions, nuts, caps, adaptors and nipples, large numbers of special parts are made to designs of the principal firms engaged in the aircraft industry.

They also specialise in the manufacture of instrument components for recording and pressure gauges, in addition to possessing an extraordinarily well-equipped plant for producing time lags for electrical switchgear, escapements, gear wheels, quadrants, pinion shafts, etc.

A mechanical oil pump unit as used by well-known aircraft firms is produced in large quantities. Neat, compact, and efficient, it is fitted with a variable relief valve and operates at any reasonable pressure in either direction. Delivery, according to model, is from one to four gallons per hour.

The Ki-gass priming device is another product, well known to the industry, that is made by Rotherham's.



A neat Rotherham mechanical pump for bearing lubrication.

Steel Structures

A LIST of approximate costs and amounts of material, most useful to prospective purchasers, is published by A. and A. J. Law, Ltd., of 132, Kingston Road, Merton, London, S.W.19, who are specialists in all types of steel-frame buildings, in particular hangars, garages and stands.

For Presswork

"EMRICH" power-driven press and draw hammers, which are said to be ideal for working light metal, are now available from E. H. Jones (Machine Tools), Ltd., of The Hyde, Hendon, London, N.W.9. Of the many advantages claimed for the machines, the "elastic" blow of variable force and the large space between the guides are especially worthy of commendation.

Ubiquitous Cranes

THE Air Ministry has placed a large order for a new type of mobile crane, to be used in hangars and other restricted spaces for removing and replacing aero engines and for general utility work. These cranes have pneumatic tyres which, it has been found, will allow their use on softer ground, and will also reduce wear and tear. The manufacturers are Ransomes and Rapier, Ltd., of Ipswich.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

J. V. RUSHTON (BIRMINGHAM) LTD. Private company, registered February 27. Capital, £5,000 in £1 shares (2,000 10 per cent. cumulative preference and 3,000 ordinary). Objects: to construct and work plants for anodising, more particularly to Air Ministry Specification, in association with J. V. Rushton (Wolverhampton) Ltd., and J. V. Rushton (London) Ltd. (when incorporated). The subscribers are: John V. Rushton, director of J. V. Rushton (Wolverhampton) Ltd., and Mrs. Florence Rushton, Solicitor: J. E. Partington, Wolverhampton.

J. V. RUSHTON (LONDON), LTD., was registered as a private company on March 10 with a nominal capital of £5,000 in £1 shares. Objects: to construct and work plants for anodising, more particularly to Air Ministry specification in association with J. V. Rushton (Wolverhampton), Ltd., and J. V. Rushton (Birmingham), Ltd. (when incorporated), and generally for the protection and colouring of aluminium and its alloys; to carry on business as anodisers, metal finishers, depositors and sprayers, etc. The subscribers are John V. Rushton, 134, Mount Rd., Penn, Wolverhampton, anodic oxidation chemist; and Mrs. Florence Rushton.

ANGLO-EUROPEAN AIRWAYS LIMITED was registered as a "private" company on March 18, with a nominal capital of £100 in 100 shares of £1. Objects: to import, export, manufacture, grant licences in respect of and deal in aeroplanes, seaplanes and aircraft of all kinds; transport contractors and carriers by aeroplane and other means, etc. The directors are: Thomas Nash (managing director), 184, Stanley Park Rd., Carshalton (proprietor of Nash Aircraft Sales); Chas. John Roberts, 27, Montpellier Rd., Purley, accountant. Regd. office: Room 159, Airport of London Croydon, Surrey.

INTAVA, LTD., was registered as a private company on March 20, with a nominal capital of £1,000 on 1,000 shares of £1. Objects: to deal in petroleum products and products mixed or used in conjunction therewith, and any other liquid fuel or lubricants, in so far as the same are or may be used in or for aircraft or for aviation purposes, etc. The subscribers are Fredk. J. Wolfe, 36, Queen Anne's Gate, London, S.W.1 (company director); A. L. McColl, Caxton House, London, S.W.1 (company director). The first directors are to be appointed by the subscribers.

OGILVIE AIRCRAFT, LTD., private company, registered March 18. Capital, £1,000 in 500 5 per cent. cumulative preference shares of £1 each and 5,600 ordinary shares of 2s. each. Objects: to carry on the business of dealers in and factors of aeroplanes, petrol engines, etc. The directors are: Leo. Elton, 9, Hollycroft Ave., Hampstead, London, N.W.3; Christopher P. B. Ogilvie, 437A, High Rd., Willesden, London, N.W.10; Mrs. Ivy E. Ogilvie, and Frank W. Tilly.

SCOTTISH MACHINE TOOL CORPORATION LIMITED was registered in Edinburgh on March 13 as a public company with a nominal capital of £400,000 in 2,000,000 shares of 4s. each. Objects: to acquire the businesses of (1) James Allan Senior and Son, Ltd., of Elmbank Foundry, Glasgow; (2) James Bennie and Sons, Ltd., of Clyde Engine Works, Govan, Glasgow; (3) Loudon Brothers, Ltd., of Clyde Engineering Works, Johnstone, Renfrewshire; (4) G. and A. Harvey, Ltd., of Albion Works, Woodville St., Govan, Glasgow; and (5) Craig and Donald, Ltd., of William Street Works, Johnstone, Renfrewshire. The directors are: Sir Harry Greer, Hugh Osborne Bennie, Graham Donald, Robert Goudie, Eric Wm. Muirsmith, Alexander B. Clements, and Douglas Sharp. The registered office is at Elmbank Foundry, 37, Farnell St., Glasgow, C.4.

THOROUGHBRED MODELS LTD.—Private company, registered March 15. Capital, £500 in 500 shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in model aircraft, novelties, toys, etc. The directors are: Fredk. R. Barnard, Edward H. Brindley, Hugh C. Holbeach, Ivor J. Pousson and Albert H. Vilen. Registered office: Africa House, Kingsway, London, W.C.2.

SEARLE AIRCRAFT AND SHEET METAL WORKS LTD.—Private company, registered March 8. Capital, £2,000 in 2,000 ordinary shares of £1. Objects: to carry on business as manufacturers of and dealers in aircraft, including floats, pontoons and sheet metal parts, etc. The directors are:— Chas. Searle and Chas. T. Searle. Registered office: 122-8, Arlington Road, Camden Town, London, N.W.1.

CAMBRIDGE UNIVERSITY GLIDING CLUB PROPRIETARY, LTD.—Private Company, Registered March 11. Capital, £500 in 500 shares of £1 each. Objects: To promote, assist and encourage gliding, soaring and aerial navigation, etc. The first directors are: Ralph C. G. Slazenger and William D. MacClement. Registered office: 1, Benet Street, Cambridge.

INCREASES OF CAPITAL

WESSEX AIRCRAFT ENGINEERING COMPANY LTD.—(273,998), High Post Aerodrome, Middle Woodford, Salisbury. The nominal capital has been increased by the addition of £4,300 in £1 shares, beyond the registered capital of £5,700.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc).

(*Published March* 11, 1937).

19478. HARLEY, M. C.: Airscrews (461,007)
22448. BAYNES, L. E.: Propulsive systems for aircraft (461,010).
22616. BEADON R. R. à COURT: Aeroplanes or flying machines (461,318).
22936. RIBBESFORD CO., LTD., AND ONIONS, J. H.: Resilient struts for use more especially in connection with the landing wheels of aeroplanes (461,144).
23357. BENDIX AVIATION CORPORATION: Brakes (461,284).
26982. ANDREWS, H., AND HADEN, C. I.: Fuel tanks for aeroplanes, military cars, and the like (461,020).
34641. FAIREY AVIATION CO., LTD., AND YOUNGMAN, R. T.: Mechanism for actuating the control surfaces of aircraft (461,157).
35332. FAIREY AVIATION CO. LTD., LOBELLE, M. J. O., and VOSS, E.: Folding wing aircraft (461,158).

(*Published March* 18, 1937).

20010. BECHEREAU, L., and CARROUEE, R.: Oscillation vibration damper for the mechanism controlling the movable flaps of aeroplanes (461,353).
22399. MAYROW, J. J.: Construction of aircraft bodies, wings, and aerofoils (461,356).
23148. KANGABE, A. R.: Apparatus for signalling from or for display purposes in connection with aircraft (461,669).
23223. COURTAULDS, Ltd., and SMITH, E.: Production of parachutes (461,625).

(*Published March* 25, 1937).

23778. VICKERS (AVIATION) LTD., and PIERSON, R. K.: Method of carrying bombs on aircraft (461,814).
24140. BARRETT, F. F., and BURGESS, F. W. C.: Internal combustion engine arrangements for aircraft, vessels, and vehicles (461,996).
24540. SCHWARZ, GES. G.: One-blade airscrew propeller or screw wind wheel (462,037).
25119. NORTH, J. D.: Method and means for controlling the fire of guns on aircraft (461,824).
31228. WIFFEN, G.: Ventilators for road vehicles, aircraft and ships (461,711).
4004. BENDIX AVIATION CORPORATION: Brakes (461,773).
8775. VULLIERME, M.: Purification of the liquids used in aircraft provided with propellers (461,846).

(*Published April* 1, 1937).

29120. SHORT BROS. (Rochester & Bedford) Ltd., and PARKER H. G.: Gun mountings for aircraft (462,188).
2870. OGER, G.: Machines travelling in the body of a fluid (462205).
18983. PASSAT, H. J. B.: Aeroplanes (462,272).

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